Postgraduate School

Research Capacity Development Unit

UNIVERSITY OF JOHANNESBURG

PG & PDRF

Annual Research Conference

2023

DATE ▪ 20 October 2023

TIME ▪ 08:00 – 16:00

VENUE ▪ EMPERORS PALACE CONVENTION CENTRE, KEMPTON PARK, JHB.

A word of welcome from the Acting Senior Director of the Postgraduate School

Professor Penny Govender

Dear Conference Attendees

It's that time of the year where we again welcome you to our Annual Postgraduate (PG) & Postdoctoral Research Fellow (PDRF) Conference! This year marks the twelfth conference of us celebrating the research excellence taking place across the University of Johannesburg at large. The Postgraduate School unreservedly continues to strive forward with intent to creating opportunities for excellence in research and innovation, excellence in teaching and learning, an international profile for Global Excellence and Stature (GES), an enriching student-friendly learning and living experience, National and Global reputation management, and fitness for GES: Societal Impact.

The PGS and UJ community have worked tirelessly towards putting this conference together, including the organizing committee, operational staff, sponsors, head judges, judges, and conference chairpersons. Furthermore, I would like to thank the presenters for showing an interest in this conference and for their preparation and participation, as well as all conference attendees for joining us and providing support for this event.

We have a great programme of topics lined up, including talks from distinguished keynote speakers, showcasing of PG & PDRF research in the form of poster presentations and five parallel oral presentations covering a wide range of topics in GES 4IR and the likes thereof, and an awards ceremony to conclude the day. We are excited to be hosting our next generation of leaders and pioneers in research. We hope you have a stimulating and informative experience at our 2023 Annual Postgraduate (PG) & Postdoctoral Research Fellow (PDRF) Conference.

Warm regards,

Prof Penny Govender

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Venue Information

This year, the conference is held at the Emperors Palace Convention Centre, Kempton Park, Johannesburg.

Address: 64 Jones Rd, O.R. Tambo, Kempton Park, 1627.

Parking: Provided within Emperor's Palace, directly outside the convention centre. Please inform the security guard that you are there to attend the "PG & PDRF Annual Research Conference" or "UJ conference".

Lunch: Buffet style - Served in the dining area from 12:00-13:00. Please ensure you keep your drink voucher safe.

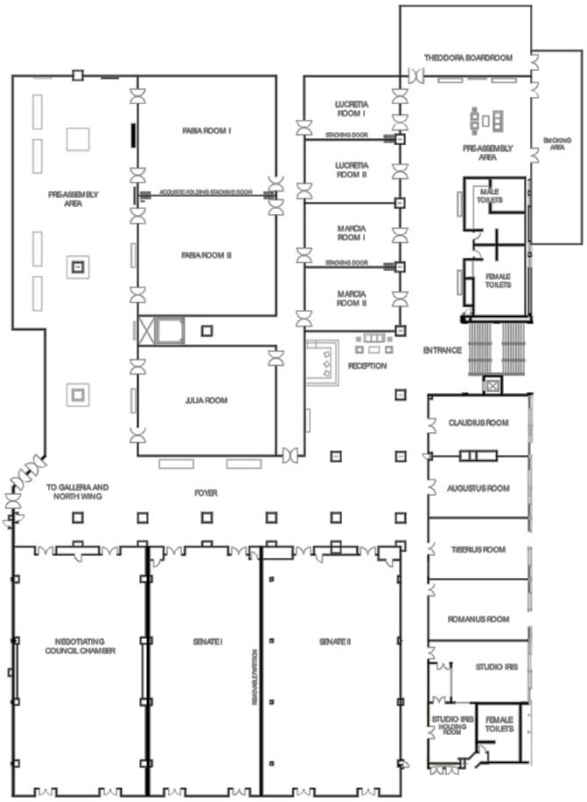
Water, Tea and Coffee stations will be provided within the venue throughout the day.

The venues for the conference are as follows (please see programme on page 8 for breakdown)**:**

- **Registration –** Emperors Palace Foyer, outside Fabia
- **General events** - Fabia
- **Oral presentations** - will take place in parallel sessions in the following rooms:

  - Fabia
  - Claudius
  - Augustus
  - Tiberius
  - Julia

- The **Poster Session** will take place in Emperors Palace Foyer outside the Fabia room) during the lunch time slot. Participants to ensure that they stand next to their posters during the allocated time.



General Information

Attendee Registration

- When you arrive – please sign in at the registration table outside the Fabia room.
- You will receive a conference **goodie bag** which will contain:
  - **Name tag** – please wear this throughout the day, to be identified by conference attendees and venue.
  - Conference Programme
  - **Drink Voucher -** please do not lose this as the venue will not provide you with a drink without the voucher.
  - Assorted gifts

Online Audience

- **Link:** https://zoom.us/webinar/register/WN_JTHVYgx6Qb6ClbVYSTi0qg
- Once in Zoom session, please ensure your mic is muted and your camera is switched off.
- For the schedule oral category sessions (See programme on page 8 for assigned speakers and times), we will be live streaming using Zoom Breakaway rooms. Please select the Breakaway room of your choice under the "More" tab on you Zoom control panel at the bottom of the screen.

Conference feedback

- Please take the time to complete and submit the conference feedback form before the conference ends.
- If a conference attendee is not able to fill in the survey online, please ask one of the organizing committee members for a physical form.
- If using a phone, please ensure to scroll across the screen to view all rating options.

https://forms.office.com/r/KfWjzCmB57

https://forms.microsoft.com/r/2BKLpugVZX

QR code

Open the built-in camera app on your phone.
Point the camera at the QR code.
Tap the banner that appears on your phone

Link: Paste in Browser using laptop or phone

Disclaimer

All entrants were requested to revise their abstract submissions as per the abstract template provided prior to compilation of the Book of Abstracts. It is also assumed all abstracts were checked and submitted with the approval of supervisors and co-supervisors. Abstracts published as is and not in the correct template means that the entrant did not comply with the instructions issued from the organizing committee and updated abstracts were unavailable at the time of publication of the Book of Abstracts.

Prizes

Category	First Place	Second Place	Third Place	People's Choice Award
Masters - Poster	R 3000	R 2000	R 1000	-
PhD - Poster	R 3000	R 2000	R 1000	-
Masters General - Oral	R 5000	R 3000	R 2000	R 5000
Masters GES/4IR - Oral	R 5000	R 3000	R 2000	R 5000
PhD General - Oral	R 5000	R 3000	R 2000	R 5000
PhD GES/4IR - Oral	R 5000	R 3000	R 2000	R 5000
PDRF - Oral	R 5000	R 3000	R 2000	R 5000

* Cash prizes will be paid to recipients after the conference – date to be confirmed and communicated
* First, Second and Third place winners will receive trophies.
* People's Choice Award winners will receive presentation cheques and is only eligible for the oral presentation categories: PDRF; PhD (GES/4IR); PhD (General); Masters (GES/4IR) & Masters (General).

People's Choice Award Voting

The People's Choice Award Voting will be made available at 15:15 and will close at 15:20. Voting will be done online using the link or QR code provided below. Voting is available to both the conference attendees and the online audience.

- If a conference attendee is not able to vote online, please ask one of the organizing committee members for a physical form.
- If using a phone, please ensure to scroll across the screen to view all rating options.

QR code

Open the built-in camera app on your phone.
Point the camera at the QR code.
Tap the banner that appears on your phone

Link

https://forms.microsoft.com/r/k3QkvKSJYd
Paste in Browser using laptop or phone

Conference Programme

08:00 – 09:00	**Registration:** Emperors Palace foyer	**11:40 - 13:00**	**Lunch:** Emperors Palace Dinning Area	**15:20 - 16:00**	**Awards Ceremony:** PGS representatives, Headjudges, Judges and Chairs - Fabia
09:00 – 09:10	**MC/Chairperson:** Dr Shandre Pillay - Fabia	**13:05 - 13:25**	**Keynote Speaker 2**: Ms Minenhle Matela -Fabia		**Judge/Chair/Sponsor Gift Ceremony:** PGS representatives -Fabia
09:10 – 09:20	**Welcome:** Prof Penny Govender (UJ PGS Acting Senior Director) - Fabia	**15:00 - 15:15**	**Tea:** Emperors Place Foyer		**Vote of thanks and Closing:** Mr Praveen Singh(PFM Head of Department) - Fabia
09:20 - 09:40	**Keynote Speaker 1:** Dr Lukman Olasunkanmi -Fabia		**Judges Review Session** - Breakaway rooms		
09:40 - 09:55	**Tea:** Emperors Palace foyer	**15:15 - 15:20**	**People's Choice Award Voting** - Fabia		

Session 1

Venue	**Fabia**	**Julia**	**Claudius**	**Augustus**	**Tiberius**
Category	**PDRF**	**PhD (GES/4IR)**	**PhD (General)**	**Masters (GES/4IR)**	**Masters (General)**
Head Judge	Prof Heather Morris-Eyton	Dr Lukman Olasunkanmi	Mr Zander Janse van Rensburg (NWU)	Dr Patrick Imoisili	Dr Vanishree Pillay
Judge	Dr Anine Crous Dr Abdulwakeel Ajao Dr Nokalika Zwane	Dr Herman Boikanyo Dr Marietjie Richter Dr Ayodele Ogegbo	Dr Marthe Djuidje Fotsing Dr Guy Mihindou Prof Kriveshini Pillay	Dr Lerato Matshaka Dr Pfariso Maumela Dr Rita Okpuwhara	Dr Fumane Khanare Ms Martha Chadiywa Dr Emmanuel Igumbor
Chairs	Ms Dudu Mbatha	Prof Kulsum Kondiah	Prof Faraimunashe Chirove	Dr Emmanuel Rowlands	Dr Richard Devey
Timeline	**Presenters**	**Presenters**	**Presenters**	**Presenters**	**Presenters**
10:00 – 10:15	Claris Siyamayambo	Chandan Saha	Refilwe Chilo	Madlela Nkomo	Keletso Buthane
10:20 – 10:35	Udeme Jacob	Noluthando Mdlalose	Thobekile Masombuka	Lintle Pheko	Kutlano Ramotshela
10:40 – 10:55	Martine Diepenbroek	Kave Moloudi	Caeleigh King	Vitalis Mbayo	Dineo Molise
11:00 – 11:15	Gabriel Mhonyera	Rabia Bhamjee	Nancy Nhemachena	Tshiamo Leta	Londolani Munzhedzi
11:20 – 11:35	Lee Heine	Lerato Nephali	Asanda Nesindande	Mercy Shibalabala	Savannalee Hodgkinson
11:40-11:50	Watson Munyanyi	-	-	-	-

Individual Photos/Group Photo after session - Emperors Palce Foyer/Breakaway rooms

Session 2

Venue	**Fabia**	**Julia**	**Claudius**	**Augustus**	**Tiberius**
Category	**PDRF**	**PhD (GES/4IR)**	**PhD (General)**	**Masters (GES/4IR)**	**Masters (General)**
Head Judge	Prof Heather Morris-Eyton	Dr Lukman Olasunkanmi	Mr Zander Janse van Rensburg (NWU)	Dr Patrick Imoisili	Dr Vanishree Pillay
Judge	Dr Anine Crous Dr Abdulwakeel Ajao Dr Nokalika Zwane	Dr Herman Boikanyo Dr Marietjie Richter Dr Ayodele Ogegbo	Dr Marthe Djuidje Fotsing Dr Guy Mihindou Prof Kriveshini Pillay	Dr Lerato Matshaka Dr Pfariso Maumela Dr Rita Okpuwhara	Dr Fumane Khanare Dr Martha Chadiywa Dr Emmanuel Igumbor
Chairs	Ms Dudu Mbatha	Prof Kulsum Kondiah	Prof Faraimunashe Chirove	Dr Emmanuel Rowlands	Dr Richard Devey
Timeline	**Presenters**	**Presenters**	**Presenters**	**Presenters**	**Presenters**
13:30 - 13:45	Sulaimon Adewale	Ross Stewart	Mawande Shinga	Melissa Moothee	Yaasirah Choonara
13:50 - 14:05	Enock Ndawana	Loice Takaedza	Ismael Ochen	Boitumelo Motlhatlhedi	Tinotenda Bangajena
14:10 - 14:25	Shallone Munongo	Alexander Chota	Simone Ferreira	Blessing Masora	Esther Longwe
14:20 - 14:35	Zaakirah Delair	Linda Malifete	Mbali Mabaso	Patrick Makhubalo	Sebetlela Letlhabula
14:40 - 14:55	Priscilla Masamba	Pooja Kumari	Emmanuel Tsara	Nokwanda Mathenjwa	Khumo Radikae

Individual Photos/Group Photo after session - Emperors Palace Foyer/Breakaway rooms

11:40 - 13:00	**Poster Session - Emperors Palace Foyer**			Students to stand next to their posters during the judging session	
	Masters			**PhD**	
Head Judge	Dr Krishna Govender			Dr Atheesha Singh	
Judges	Dr Zaakirah Delair and Dr Elizabeth Nkosi			Dr Anesu Kuhudzai and Dr Claris Siyamayambo	
Presenters	Boitumelo Ntisa	Thabo Ramatapa	Thandekile Ryumeko	Shobana Nagaraj	Thandiwe Maumau
	Dumisani Mgidi	Letacia Sekanka	Sabina Malete	Refilwe Lukwhareni	Fikile Yalo
	Isac Mabunda	Dimakatso Maheso	Kgaugelo Masia	Thato Seopetsa	Thembisile Mbatha
	Katlo Keitemoge	Mpolokeng Mongake	Tho-Marie Stoltz	Zamancwane Mahlanza	Kagiso Tukisi
	Pertunia Dikotla	Aviwe Matandela	Faith Muramba	Jabulani Matsimbe	Xola Ntlangula
	Palesa Hlela	Fezile Motsoene	Vincent Masilela	Dipuo Kgabi	Lethabo Gaebee
	Karabo Rikhotso	Tshamisane Mkhari		Lanrewaju Fajimi	Maria Rodner
	Muzi Buthelezi	Seakga Tladi		Seloka Mohlago	Akhona Myoli
	Zandile Tsotetsi	Kagiso Motlhatlhedi		Bopaki Phogole	Dimpho Moletsane
	Sikhulile Mkhonza	Andries Ndlovu		Samuel Gbashi	Thabiso Mzinyati
	Millecia Ramaremela	Humbulani Ratshirumbi		Betty Sebati	Dance Mabu

Individual Photos/Group Photo after session - Emperors Palace Foyer/Breakaway rooms

Meet Your Keynote Speakers

Dr Lukman O. Olasunkanmi is a Senior Lecturer in the Department of Chemistry, Obafemi Awolowo University (OAU), Ile-Ife, Nigeria. He obtained his PhD in Chemistry from the North-West University (NWU), South Africa in 2016, MSc. (Chemistry) from Obafemi Awolowo University (2012), and BSc. (Hons) (Chemistry) with a First Class in 2007. He had served as a Postdoctoral Fellow at North-West University and University of Johannesburg. He is a Physical Chemist with research interests in kinetics and thermodynamics of metals/alloys corrosion, corrosion inhibition, as well as quantum chemical calculations of molecular and electronic structure. He has made significant contributions to research in corrosion science and inhibition, as well as theoretical investigation of molecular and electronic properties of organic molecules and metal complexes, leading to the design of materials with fascinating physical and chemical properties. He has authored/co-authored over a hundred publications in reputable peer-reviewed journals and presented his research works at various conferences. He is a reviewer to many scientific journals, home and abroad. He has supervised/co-supervised six (6) postgraduate students (M.Sc. and PhD). He has won several academic excellence awards, including the Global Excellence and Stature Postdoctoral Fellowship Award of the University of Johannesburg (2020 – 2021), Dapo Afolabi Most Productive Science Scholar Award of the Faculty of Science, OAU, Nigeria (2017), and Kayode Adebowale National Young Scientist Prize in Chemical Sciences (awarded by the Nigerian Young Academy) (2017). He is a Fellow of the Africa Science Leadership Programme (ASLP), a Fellow of the Nigerian Young Academy (NYA), a member of Chemical Society of Nigeria and an affiliate member of African Academy of Science (AAS). Dr. Olasunkanmi currently holds a Senior Research Associateship position at the Department of Chemical Sciences, Faculty of Science, University of Johannesburg (UJ). He has served as a speaker/facilitator/resource person at numerous career enriching workshops and seminars. He is currently the Vice-Dean, Division of Student Affairs, Obafemi Awolowo University, Ile-Ife, Nigeria.

Ms Minenhle Matela holds an Honours Degree in Social Work from the University of Johannesburg (UJ) and a qualification in Advanced Project Management from the University of South Africa (UNISA). She has also completed a Leadership Programme with the Johannesburg Business School (JBS) and a Master of Management in Governance specialising in Development and Economics with the University of the Witwatersrand in South Africa (WITS). Currently, Minenhle holds multiple roles, including Social Work Internship Facilitator, and Supervisor at the University of Johannesburg's Faculty of Humanities, Department of Social Work and Community Development. Additionally, she serves as the Office Manager and Researcher at the Southern African Policy and Development Nexus (SAPDN) and Social Work Coordinator for Trauma and Healing at the Whitaker Peace and Development Initiative (WPDI). With extensive experience in international, continental, regional, and local development, and research matters, Minenhle has gained proficiency in both quantitative and qualitative research methodologies. She is passionate about creating positive change through Human and Social Development and is committed to driving policy reform and promoting economic empowerment to achieve her goals of a better world for all.

Meet Your Conference Judges
Oral Category

PDRF

Head Judge

Prof Heather Morris-Eyton is an associate professor in the Faculty of Health Sciences (Department of Sport and Movement Studies). She holds a doctorate in sport science and completed the post graduate research supervision diploma in 2021. Her research interests include sport coaching education, antidoping and safeguarding as well as women in sport. She has supervised numerous masters and doctoral students and has a keen interest in assisting novice supervisors and post graduate students in their supervision and research journeys.

Judges

Dr Anine Crous is a researcher associated with the Laser Research Centre and lecturer at the Faculty of Health Sciences' Department of Biomedical Sciences, University of Johannesburg in South Africa. The researcher studies photodynamic treatment (PDT), photobiomodulation (PBM), stem cells, cancer stem cells (CSCs), and gold nanoparticle antibody conjugates. Dr. Crous has published 24 articles, chapters, and proceedings. Dr. Crous peer reviews for numerous top international scientific journals. Her Scopus citation count is 132, and her H-index is 7. Additionally, her Google Scholar h-index is 7 with 201 citations. Dr. Crous supervises three doctoral students and one Postdoctoral Research Fellow. In 2022, she was named a rising leader scholar in Industrial Psychology and People Management.

Dr Abdulwakeel Ayokun-nun Ajao is a Postdoctoral Research Fellow at the Department of Botany and Plant Biotechnology, University of Johannesburg, South Africa. He obtained his PhD degree in the study field of Botany from the same institution. His Bachelor of Science with honours degree and Master of Science were also obtained in Botany from Obafemi Awolowo University, Ile-Ife, Nigeria. His research interest is focused on ethnobotany, ethnopharmacology, plant taxonomy and systematics. He received the Dan Nicolson Fellowship in Plant Systematics in 2017 and had travel grant awards to present papers at international conferences. He has published over 30 indexed articles and is a reviewer for leading journals.

Dr Busisiwe Nokalika Zwane obtained her PhD (Chemistry) at the Department of Chemical Sciences, Faculty of Science at the University of Johannesburg in 2021. Her study was based on the use of Advanced Oxidation Processes for the treatment of antibiotics in water, the study was novel for she deeply followed the degradation pathways and investigated the reaction kinetics and catalysis of the pollutants. Currently, Dr Zwane is an assistant lecturer at the Department of Chemical Sciences teaching Analytical Chemistry Practical and Theory modules to the students studying towards Food technology and Biotechnology Diploma at the Faculty of Science at UJ. She has published two articles and co-authored seven articles in internationally reputable journals.

Head Judge

Dr Lukman O. Olasunkanmi – See bio on page 9

Judges

Dr Dinko Herman Boikanyo worked previously as a Principal Scientist and a Senior Strategy Analyst for Sasol Technology and Sasol Mining respectively. He also worked in a Sourcing and Marketing Management role for a gold refinery before joining UJ as a senior lecturer in the Department of Business Management. He is currently a departmental Coordinator for the Masters and Doctoral Program, as well as a coordinator for Research Projects for Honors students. He is a deputy chair of the departmental Postgraduate Research Committee which is responsible for screening M&D proposals and approving titles and assessors at dept level. He serves in the Ethics, Teaching and Learning, Dept Leadership and College Higher Degree committees.

Dr Marietjie Richter is a qualified paediatric Optometrist. She started her career as an academic at the then Rand Afrikaans University in 1992, as a part-time lecturer and was appointed full-time in 1994. Apart from completing her Doctor in Philosophy (Optometry) degree, she also holds a master's degree in business management from UJ. She is a former Head of Department of Optometry (UJ) and was also seconded to the Faculty of Health Sciences, as Head of Faculty Administration for 2 years. She is a Member of the Golden Key International Honour Society and current Vice President of the African Chapter of the American Academy of Optometry and a Fellow of the same organization.

Dr Ayodele Ogegbo is a researcher and educator in the field of science education in the Department of Science and Technology Education (SCITECHED), University of Johannesburg. Her main research interest is in inquiry-based science education and technology in science education. Dr Ogegbo obtained her Ph.D. in Science Education from the University of Pretoria in 2018 and her MSc in Environmental Education and BSc (Ed) in Physics from Lagos State University in 2012 and 2007 respectively. Her research has been published in several local and international top-tier journals in her discipline. Before joining the University of Johannesburg, Dr. Ogegbo worked as a senior education officer at the Lagos State Ministry of Education and served in various leadership capacities.

PhD General

Head Judge

Mr Zander Janse van Rensburg is a lecturer in the North-West University's (NWU), where he contributes to the Institution's academic writing development strategy. In accordance with this strategy, he also established the NWU Writing Centre in 2014, where he still serves as manager. In 2019, the NWU Registrar appointed him as the university's subject specialist on plagiarism. His work, in this regard, focuses on forensic investigations into misconduct at all levels of academic practice. For these purposes, he has also led the development of specialised forensic software aimed at investigating various forms of academic misconduct. Further research interests include philosophical inquiry and, more specifically, hermeneutic phenomenology.

Judges

Dr Marthe Carine D. Fotsing is currently a senior lecturer at the Department of Chemical Sciences of the University of Johannesburg. Her postdoctoral training was focused on heterocycles of biological importance. She received her PhD in Chemistry from the same institution in 2014 while working on bisphosphonates and their biological applications. Her research interests are centered around heterocycles from the laboratory and nature with potential biological activities.

Dr Guy R Mihindou holds a DLitt. degree from Stellenbosch University and is a fulltime employee at the University of Johannesburg (UJ). He is the head of Academic Development and Innovation (ADI) department which focuses on implementing several programmes aimed at aiding undergraduate students learning development and success. He is the founder of the University of Johannesburg English Language programme (UJELP) for international students. UJELP is an SLP geared towards the development of the English language skills (speaking, listening, reading and writing) for international students from non-English speaking countries. UJELP is based on the Common European Framework of Reference (CEFR) (Council of Europe 2001).

Kriveshini Pillay is currently a Full Professor of Analytical and Environmental Chemistry in the Department of Chemical Sciences and has been 22 years in service at the University of Johannesburg. Her research interests are in developing nanomaterials for water treatment and forensic applications. She has to date hosted five post-doctoral research fellows and graduated 20 MSc. students and 12 PhD students. She has published 76 journal articles in internationally accredited journals, 5 book chapters, 2 conference papers and filed one patent. She has presented papers at 12 international conferences, has a Scopus h-index of 31, Google scholar h-index of 31 and 2655 citations. She has served the Department of Chemical Sciences as Deputy HOD: Teaching and Learning for 3 years and also represented this Department on the Faculty Teaching and Learning Committee and Faculty Higher Degrees Committee.

Masters 4IR/GES

Head Judge

Dr Patrick Imoisili is currently a Senior Postdoctoral Research Fellow (PDRF) at Mechanical Engineering Science Department, Faculty of Engineering and the Built Environment. University of Johannesburg. He is a 4IR (Forth Industrial Revolution) Nanotechnology expert with JENANO Research Group. Dr Patrick, has published over 36 peer-reviewed articles since joining UJ in 2020. His research interest is in but not limited to chemistry, polymers, nanocomposite, nanoparticle synthesis for drug delivery, wastewater treatment, renewable energy, solar cell, thin films, green hydrogen, atomic layer deposition (ALD) research and innovations. Dr Patrick, has published over 36 peer-reviewed articles since joining UJ in 2020. with impact factors up to 16.6, and he is currently co-supervising 2 PhD students, 10 master's and 11 undergraduate students.

Judges

Dr Rita Okpuwhara completed her doctoral degree in the Department of Chemical Engineering at the University of Johannesburg in 2023. Her doctoral student compasses contributions to the nanocomposite and boat industries in solving the current global problem of boat disposal issues. Her work involved the synthesis of nanofibres from recycled plastics for use as reinforcements for nanocomposite fabrication, targeted as boat construction materials. Rita Okpuwhara is currently a researcher under the Sasol-NRF Postdoctoral Innovation Fellowship. Her continued dedication to research and her commitment to addressing real-world challenges through innovative research make her a promising in materials science and engineering.

Dr Lerato Matshaka completed her PhD in Professional Nursing Science in 2022, her Masters' degree in Ethos and Professional Practice (Cum Laude) in 2018, and her bachelor's degree (Cum Laude) in 2013. She is currently enrolled for a post-graduate diploma in Nursing Education. She is a Lecturer in the Department of Nursing at the University of Johannesburg. She was one of the eleven students that represented UJ at the Appalachian State University at the United States of America on a student exchange program in 2012. Lerato was the first recipient of the Albertina Sisulu Award in her final year of her bachelor's degree in the Department of Nursing. Lerato has published three articles in international journals, two of which she is a sole author. She is a reviewer for national and international journals. Lerato has presented at several national and international conferences. Lerato has supervised seven Masters' students to completion.

Dr Pfariso Maumela is a PhD graduate from the University of Stellenbosch and holds a BCom in quantitative management from University of South Africa. He is currently a postdoctoral researcher in the Food and Biotechnology department. His research interests are in the water-energy-food nexus.

Masters General

Head Judge

Dr Vanishree N Pillay obtained her PhD in 2021 under the supervision of Dr Z Ndaba and Dr G Gobind at the Wits Business School with a thesis entitled*: Bicultural Life Experiences and Career Orientation of South Africa Indian Women Engineers*. During 2021, Dr Pillay was invited to present the findings of her thesis at the Wits Women in Innovation Conference and featured in an article in the Wits Curiosity Magazine. In 2022, she presented her first article at the International Conference for Gender Relations (ICGR) at the University of Aveiro, Portugal. Her second article was presented online in the same year at the Indian Society of Labour Economics Conference, Uttarakhand, India. She is currently employed at the University of Johannesburg in the Postgraduate School as a Specialist: Policy, Benchmarking, Monitoring and Research.

Judges

Dr Fumane Portia Khanare is a Senior Lecturer and B Ed Honours Coordinator in the Department of Educational Psychology at the Faculty of Education, University of the Johannesburg, South Africa. Her research focuses on rural education in particular, voices of care and support for learners with neurodiverse needs in rural populations, orphans and vulnerable learners due to HIV and AIDS, and the holistic wellbeing of children and youth in Black communities. She combines asset-based approaches and arts-based research methods as pathways to advance young people's voices and agency for systematically enabling learning environments. She has been a MAC AIDS Fund Leadership Initiative Fellow at Columbia University, the University of California in Los Angeles (UCLA), and the Human Sciences Research Council (HSRC).

Ms Martha Chadyiwa is a registered EHP with the Health Professions Council of South Africa, holding a Bachelor of Science Degree in Environmental Health. Additionally, she has an MBA in Environmental and Energy Management from Twente University and completed an Honors in Leadership at the University of Johannesburg. She just completed a PhD in Public Health at Witwatersrand University, with a focus on Occupational Safety. From 2013 to 2017, she served as the HOD for the Department of Environmental Health and was involved in creating and developing content for the online Master of Public Health at the University of Johannesburg, which she currently coordinates.

Dr Emmanuel Igumbor is a highly experienced educator, lecturer, and accomplished researcher specializing in Theoretical and Computational Physics. He has obtained a Doctor of Philosophy (PhD) in Physics, at the prestigious University of Pretoria. Dr. Igumbor has made significant contributions to the realm of materials science and computational physics. His primary research focus revolves around the modeling and simulation of point defects in wide and narrow band gap semiconductors, transition metals, and graphene-based materials. Currently, Dr. Igumbor serves as a Research Fellow at the Department of Mechanical Engineering Science at the University of Johannesburg. Here, he actively engages in multidisciplinary research, particularly in the modeling of the infectiousness diseases within confined environments using Computational Fluid Dynamics approaches.

Poster Category

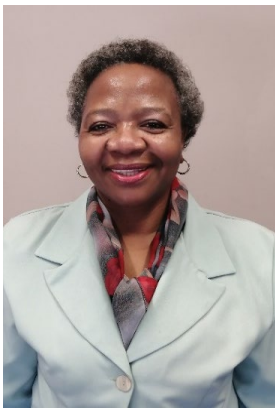
PhD

Head Judge

Dr Atheesha Singh (BSc, BSc Hons, MSc, PhD, PGDip) is a Senior Lecturer and Researcher at the Water and Health Research Centre, Faculty of Health Sciences, University of Johannesburg. Her research focuses on investigating water and sanitation challenges for people and the environment, with a special focus on health-related microbiology. She also explores the broader ecological and health impacts of pathogenic microorganisms. Dr Singh has supervised 6 doctoral, 20 masters students and 2 PDRFs at the UJ, and she lectures research methodology to Honours students within the faculty. She serves on the Faculty of Health Science Research Ethics and Higher Degree Committees. She serves on the adjudication panel for the L'Oréal UNESCO platform for Woman in Science Sub-Saharan Africa and is appointed on the Postdoctoral, Postgraduate, Travel, General and International Research Grants Virtual Peer Review Panels for the National Research Foundation.

Judges

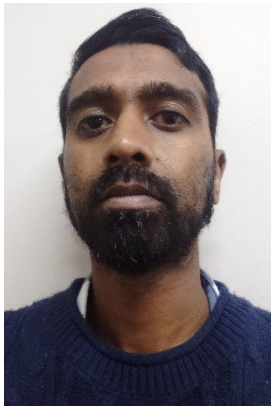
Dr Zaakirah Delair currently holds a postdoctoral position at the Water and Health Research Centre, Faculty of Health Science, University of Johannesburg. She obtained her NDip and Honors in Biotechnology with a Masters (Cum Laude) and PhD in Biomedical Technology, UJ. Her research focuses on the water-human health nexus through detection and identification of *E. coli* and related pathogens from different sample types. Her expertise and work experience include the use of microbiology and molecular biology techniques to explore the depths of microbial life in water and protect human health, making access to safe water a reality. The methods developed throughout her research period have been used as routine analysis in the WHRC laboratory and undergrad studies. She has assisted students in unlocking their potential by providing training and supervision to students within UJ and externally. Dr Delair has been extensively involved in field work for sample collection.



Dr Elizabeth Malefu Nkosi (PhD) is a Nursing Management specialist. She is a lecturer at University of the Johannesburg in the Nursing Education Department, where she facilitates lectures for the postgraduate students registered for the Postgraduate Diploma (PGDip) in Health Services Management, and undergraduate students registered for the Bachelor of Nursing (BN) programs. She obtained the degrees in Baccalaureus Curationis (Ed et Admin) Community Nursing in 2010, and Master of Nursing Science, Nursing Management in 2017, both at the University of Johannesburg. She obtained the Doctor of Philosophy (DPhil) degree in Nursing at the University of the Witwatersrand in 2023. She supervises post basic students registered for the degree in MCur Nursing Management. Her research project is aimed at promoting patient safety through the reduction of adverse events. She has presented and published her research locally and internationally.

Masters

Head Judge



Dr Krishna K. Govender is a Senior Lecturer and head of the computational chemistry and molecular modelling laboratory (CCMM) at the University of Johannesburg, within the Department of Chemical Sciences. He is a computational chemist and material scientist whose research focuses on computer aided drug design in pursuit of more effective drugs for the treatment of cancer. The computational methodologies and tools utilized in his group include molecular mechanics, molecular docking, quantum mechanics, molecular dynamics, and python. He is the chair of the South African Chemical Institute (SACI) Molecular Modelling Division, a member of the National Institute of Theoretical and Computational Sciences (NITheCS) and has received a Y2 rating from the National Research Foundation (NRF), South Africa. He supervises a total of 2 MSc and 4 PhD students and has numerous collaborations nationally and internationally. He has over 40 publications in peer reviewed journals.

Judges

Dr Anesu G. Kuhudzai completed a PhD in Medical Sciences (Applied Statistical Models to Medical Research) from University of Antwerp, Belgium. Four Journal Articles were published from his PhD work in high impact Journals. He is a registered Chartered Statistician and one of the Directors of the Institute of Certificated and Chartered Statisticians of SA (ICCSSA). He is a detail-oriented Statistical and Data Science Consultant with extensive hands-on experience acquired within private companies and top-tier academic institutions in South Africa, Zimbabwe, UK & China. He has assisted 1 500 postgraduate students from honours to post-doctoral level and staff researchers engaged in multi-disciplines of research, with quantitative research designs, data analysis and interpretation of statistical results to enhance research output and publications.

Dr Claris Siyamayambo is a mathematical statistician and a researcher (PhD in Statistics (2021) trained at the North-West University, South Africa, University of Botswana, and University of Zimbabwe. Dr Claris is currently a Postdoctoral Research Fellow in Public Health at the SAMRC/UJ Pan African Centre for Epidemics Research (PACER) Extramural Unit, Faculty of Health Sciences, University of Johannesburg. Prior to this, she was a senior lecturer in the Faculty of Information and Communication Technology at the Limkokwing University of Creative Technology Botswana Campus lecturing Mathematics and Statistics for Software Engineering and Business Information Systems, a lecturer at Mutare Polytechnic College in Zimbabwe lecturing Mathematics and Statistics in Civil and Electrical Engineering department and she has taught in high schools in Rusape and Marondera in Zimbabwe teaching Mathematics and Statistics.

Meet Your Conference Chairpersons

Oral Category

PDRF

Ms Dudu Mbatha currently works at the Postgraduate School as Coordinator for Postdoctoral Fellows. She has worked for several entities before joining the University of Johannesburg (UJ). Her first job was at the South African Revenue Service (SARS), she moved to Ernst & Young, then to KPMG. Her previous job expertise revolved around Tax consultation. She has acquired her qualifications from UJ, with the first qualification in Cost and Management Accounting, followed by the Higher Diploma in Taxation, and her recent qualification is the Postgraduate Diploma in Financial Markets. Her role at UJ is in the coordination of Postdoctoral Research Fellows (PDRFs) funds based on the allocated yearly budget and to ensure that there are process in place to monitor the number of research publications produced by the PDRFs.

PhD GES/4IR

Associate Prof Kulsum Kondiah is the Head of Department (Teaching and Learning) at the Department of Biotechnology and Food Technology (Faculty of Science) at the University of Johannesburg. She has been teaching for over 15 years and her research focuses on the development of nano-based solutions for pathogen surveillance and bioremediation in the water sector. She has supervised 46 PhD and MSc candidates. Her research has been published in peer-reviewed journals, presented at national and international conferences and she holds a registered patent. She is the recipient of several awards including the 2021 UJ Faculty of Science Excellence in Teaching and Learning award. Most recently she was listed in the top 5 finalists for the 2023 HERS-SA Higher Education Women Leaders Awards in two categories: Humanitarian and Women in STEM.

PhD General

Prof Faraimunashe Chirove is a holder of a PhD (2011) in Mathematics (Mathematical Biology) from University of Botswana. He is currently employed as an Associate Professor at University of Johannesburg's APK Campus in the department of Mathematics and Applied Mathematics. He has over 20 years of experience in teaching at Higher education institutions in Zimbabwe, Botswana and South Africa. His broad research objective is 'from omics to population dynamics', an objective that seeks to understand, interpret, explain, and account for the impact of infection across different hierarchical levels within and without the human body expanding research interests into mathematical ecology, data-based modelling, agent-based modelling, zoonotic diseases, stochastic modelling, multi-scale modelling, antimicrobial resistance in agricultural settings and, systems mathematical biology.

Masters GES/4IR

Dr Emmanuel Rowlands is a Postdoctoral Research Fellow at the African Centre for Evidence (ACE) University of Johannesburg. Since joining ACE at the University of Johannesburg, Emmanuel has taken engaged in research on gender-based violence, particularly violence against men by female intimate partners in South Africa. Before joining ACE, Emmanuel previously served as a postdoc with the Centre for Social Development in Africa at the same university.

Masters General

Dr Richard Devey is the Director of the Statistical Consultation Service, Postgraduate School, University of Johannesburg, South Africa. He completed his PhD in Development Policy and Management through the University of Manchester in 2015. Prior to this he completed Masters degrees in Development Studies (University of KwaZulu-Natal) and Biological Sciences (then University of Natal). He used either survey- or experiment-based research designs for these qualifications. In the role of statistical consultant, Richard provides quantitative research design and statistical analysis support for UJ staff and postgraduate students. Prior to moving to UJ he worked on numerous survey-based research projects, taught research methods, and supervised postgraduate students in the School of Development Studies, UKZN, Durban.

Abstracts

Oral Category

PDRF

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Applications of 4IR on the diagnosis and management of STIs among key populations in Sub-Saharan Africa: A Systematic Review

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Keywords: Fourth Industrial Revolution, sexually transmitted infections, key populations, STI diagnosis, management

The Fourth Industrial Revolution (4IR) is trending because of the major transformations it has brought to human life. Artificial intelligence including machine learning are 4IR technologies that can generate intelligent machines that can be used for the diagnosis and management of sexually transmitted infections. Key populations are disproportionately affected by STIs due to specific risk behaviors, marginalization, and structural factors that contribute to a lack of access to health services. The 4IR technologies are used in reporting the key populations' STI vulnerability, transmission, and treatment. The aim of this study is to explore the use of 4IR technologies in the diagnosis and management of STIs for key populations in Sub-Saharan Africa. A review of the literature published from 2015 onwards was done. Manual and electronic searches on various databases including PubMed Central, SCOPUS, and Science Direct were conducted. The Preferred Reporting Items for Systematic Reviews and meta-analysis statements for protocol guidelines were followed, and the review is registered in the International Prospective Register of Systematic Reviews database [1]. The 4IR technologies can help to track people who have accessed STI services including those who have the potential to transmit infections. The 4IR technologies can track patients who are likely to fail to adhere to STI care services in time or not access them at all including prevention and care for the sake of enhancing patient outcomes. There remains a gap in STI prevention and treatment, especially for key populations who are unable to access sufficient STI care due to stigmatization and discrimination. The 4IR technologies can use available data for building models on STI diagnosis and care among key populations in Sub-Saharan Africa and significantly improve partner tracing, STI screening, STI literacy, and point-of-care tests required to facilitate diagnostic and management approaches.

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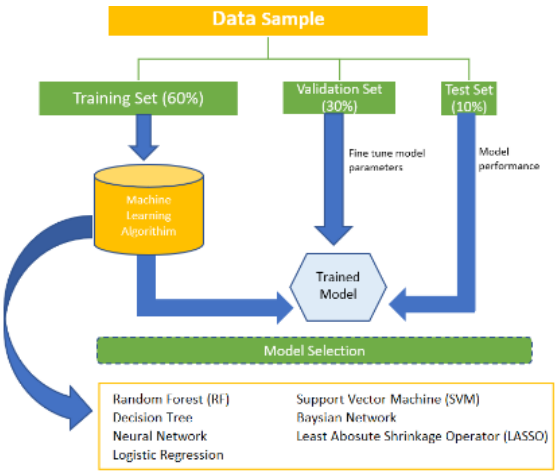
Graphical Abstract



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A Systematic Review of Prevalence of Depression among University Students.

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This systematic review examined the prevalence of depression among university students. Nine papers were eligible for inclusion in the study evaluating depression among university students. This search combines the terms such as undergraduate students, university, young adults, symptoms, and prevalence of depression. The pooled prevalence of depressive symptoms was 69.5%. The prevalence was significantly higher in female than male students, indicating gender differences in vulnerability to depression. The only study that reported a significant age difference in depression was conducted among undergraduates older than 30. Compared with the general population, university students experience significantly higher depression rates.

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The Spartan *scytale*: A simple stick or a useful cryptographic device? Misinterpretations of the use of the *scytale* as a cryptographic device in ancient Sparta in the 5th and 4th centuries BCE

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Keywords: Cryptography; ancient Greek warfare; communication security; Sparta

Concealing and hiding information from the enemy were among the common practices of ancient intelligence services – starting in the Near East. In the 2nd century CE, we see Plutarch and Aulus Gellius linking the Spartans to one particular method of secret communication in the 5th and 4th centuries BCE: the *scytale*. According to the authors, the *scytale* was a method used for sending confidential messages over long distances between the ephors in Sparta and generals in the field during campaigns (Plutarch, *Life of Lysander*, 19.5-7; Aulus Gellius, *Attic Nights*, 17.9.12-13). There is no straightforward evidence that *scytalae* were used for the purpose of secret messaging (Bauer 2013; 2017; Coles & Landrum 2009). In fact, there is more evidence from the 5th and 4th century BCE that *scytalae* were used for other purposes. With this in mind, scholars even went a step further and have incorrectly stated that *scytalae* could never have been used for the purpose of secret messaging, since the *scytale* was simply a 'stick' (the principal meaning of the word), and that the method that Plutarch and Gellius describe was far too simple to have been used effectively (Anderson 1970; Bauer 2017; Kelly 1985; 1998; West 1988). However, it will be shown in this paper that the ingenious rearrangement of the letters that Plutarch and Gellius describe as the key feature of *scytale* communication makes the *scytale* a candidate for the earliest known theoretical transposition cipher in history, and that the basis of the system still exists in modern communication security – a point that previous scholars seem to have overlooked so far.

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Assessment of the welfare and macroeconomic effects of the hypothetical SACU-US free trade agreement.

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Keywords: AGOA; CGE model; FTA; GTAP model; SACU; trade creation; trade diversion; trade negotiations; trade policy; US; welfare

The proposition that free trade among countries enhances overall economic welfare is overwhelmingly acknowledged in economic and international trade literature [1]. However, free trade is only possible through trade agreements, which are the outcomes of trade negotiations. Consequently, securing and strengthening external trade relations through distinct trade negotiations and agreements has facilitated the widening and deepening of international trade cooperation among trading nations [2]. The Southern African Customs Union (SACU) and the United States (US), in particular, have laid concrete foundations for free trade through the advancement of regional integration and extensively instituting a range of internal economic and trade policy reforms aimed at liberalizing trade [3]. SACU, established in 1910, is the oldest existing Customs Union (CU) in the world [4]. On the other hand, the US is the largest global importer and second-largest exporter of merchandise by 2023 [5]. In the context of the SACU, the US is a vital traditional trading partner for the CU from an import and export perspective, and all SACU members predominantly access the US market through the African Growth and Opportunity Act (AGOA), a US trade Act enacted in 2000 and set to expire in 2025. However, there is lingering uncertainty surrounding the renewal of AGOA beyond 2025. Hence, given the significance of the US in SACU's export accomplishments and economic development endeavours, our article recommends that SACU proactively re-engage the US in negotiating a Free Trade Agreement (FTA) that builds on AGOA and takes reciprocity into account. In fact, between 2003 and 2007, SACU and the US attempted to negotiate a FTA, but the talks collapsed [6]. While there were many contested issues that led to the collapse of the negotiations, the scope of the trade agreement, US's farm subsidies, and capacity constraints as well as the diversity and deficiency of coherence in trade and investment policy within SACU, were contemplated as the prime impediments [7]. However, the global as well as domestic political and economic environment has significantly transformed in the previous decades. It is in this setting that the present article seeks to assess the welfare and macroeconomic effects of the potential SACU-US FTA. By employing the Global Trade Analysis Project (GTAP)-Computable General Equilibrium (CGE) modelling, we found that both SACU and the US would achieve welfare gains of US$316.47 million and US$678.01 million from the formation of the prospective trade deal. The estimated macroeconomic effects are also primarily favourable for both parties. Furthermore, the formation of the potential FTA is expected to be net trade creating with a combined net trade of US$3.06 billion. The assessments in this article are significant in stimulating debate and navigating domestic policies on the welfare and macroeconomic implications of the prospective trade agreement.

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NICU patients at risk of nosocomial ESKAPE infection despite COVID-19 infection prevention protocols

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Keywords: COVID-19, ESKAPE pathogens, neonatal intensive care unit (NICU), multidrug resistance MDR, antimicrobial Resistance (AMR)

Healthcare associated infections affect millions of individuals each year. This is especially problematic when these are caused by multi- or extensively drug resistant bacteria such as the ESKAPE pathogens [1]. Healthcare associated infections increase patient morbidity and mortality [2, 3] and were of particular concern during the COVID-19 pandemic in healthcare settings with patients already battling SARS-CoV2 infection. The objective of this study is determine if bacteria isolated from neonatal intensive care unit staff and surfaces were potential sources of infection and to establish their antimicrobial susceptibility. During the COVID-19 pandemic in July, August, September, October and November of 2020, 423 surface swabs and handwash samples were collected from a neonatal intensive care unit in Sebokeng Hospital, a public hospital in Gauteng, South Africa. Samples were cultured using Baird-Parker and MacConkey agar and incubated at 37°C for 24 – 48 hours. Bacteria isolated (n=238) from 127 of the surface swabs and handwash samples were identified and 71 of these subjected to antimicrobial susceptibility testing using the Vitek 2® compact system and then categorized as multi- or extensively drug resistant [4]. Almost all (35/38, 92.1%) of the Gram-positive cocci isolated were categorized as multidrug resistant. More than two thirds (22/33, 66.7%) of the Gram-negative bacilli isolated were categorized as multidrug resistant and one was extensively drug resistant. Nearly three quarters (23/33, 69.7%) of these isolates were identified as extended-spectrum β-lactamase producers. Seventeen samples were culture-positive for ESKAPE pathogens (n=29), including *Enterococcus faecium*, *Staphylococcus aureus*, *Klebsiella pneumoniae*, *Acinetobacter baumannii*, *Pseudomonas aeruginosa* and *Enterobacter* species [5]. Over 82% (24/29) of the ESKAPE pathogens subjected to AST were identified as multidrug resistant. The presence of the multidrug resistant ESKAPE pathogens highlights the need for continued infection prevention and control programme training and reminders for staff to be implemented in public hospitals [6, 3, 7].

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Of artificial intelligence and the future of academic integrity: An Interpretive Structural Modelling evaluation of ChatGPT

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Keywords: Artificial intelligence, ChatGPT, Machine learning, academic integrity

As the ongoing wave of the fourth industrial revolution emerging technologies continues, artificial intelligence-powered writing tools have emerged to assist in generating customised natural language processing-based content. ChatGPT, an OpenAI artificial intelligence powered language model officially launched in the fourth quarter of 2022, is prominent among these writing tools. It has been commended for its ability to provide real-time accurate and human-like responses to questions and generate text outputs from substantial amounts of input data. Despite the potential benefits, one of the central questions that has emerged is whether using artificial intelligence tools such as ChatGPT automatically constitutes academic dishonesty. These applications are believed to pose potential risks of academic and even legal infringements relating to cheating and plagiarism. This question arises amid concerns that using chatbots in academic writing could compromise academic integrity or, at least, raise concerns about academic ethical violations. Using an interpretive structural modelling methodology, the current study examines the authenticity of the ChatGPT capabilities, relating them to the various academic integrity issues pertinent to higher and tertiary institutions in South Africa. Interpretive Structural Modelling is a computer-based technique to graphically represent of composite structural relationships between various elements in multiple and hardly explored disciplines. The results obtained from the study indicate, among others, that the mere use of any AI tools does not automatically constitute an academic offense unless and until the extent and parameter of use infringes on the definition of plagiarism or a breach of academic integrity as defined by the academic integrity policies of the relevant institution. As ChatGPT continues to grow in popularity, experts believe that its use in academic writing will dwindle, owing to concerns over the accuracy of its outputs and sources. One of the significant recommendations from the expert opinions was that institutions need to start exploring and creating alternative assessment methods that curtail academic misconduct while reaping the benefits of AI-powered tools.

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Post-Covid-19 male teachers' attrition in private schools: Whose fault?

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Keywords: teacher attrition, private schools, post-COVID-19, secondary schools, school policy

In recent times, private schools in Nigeria have witnessed a mass exodus of male teachers which is impacting the functionality of the schools in terms of effectiveness and quality. This study, therefore, examined the causes, impacts and roles of school management in teachers' attrition in private schools after COVID-19. The study adopted a qualitative research design of phenomenological type. Snowball and purposive sampling techniques were used to sample 11 male teachers working in private schools before the sudden appearance of the COVID-19 pandemic. Semi-structured interviews were conducted with eleven male teachers, transcribed, coded, and analysed using QSR NVivo software, version 1.7.1. The study found, among other things, that a lack of concern for teachers' welfare during the COVID-19 pandemic, poor salaries, and unpleasant school policies contributed to many male teachers' attrition in private schools. The study also found a negative impact of male teachers' attrition on the education sector. The researchers made recommendations based on the findings that Private school owners should be empathetic and always put teachers in their shoes. This could be achieved by institutionalising teachers' welfare purses. There should be a welfare committee to make this functional.

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Militarisation and its implications for state capacity in social service provision in Zimbabwe, 2000-2019.

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Keywords: militarisation; state capacity; authoritarianism; Zimbabwe; ZANU-PF; social services; human security; health; education

This study seeks to augment studies on militarisation and state capacity in Africa and other developing countries[1] It will use the case of Zimbabwe to examine how militarisation shaped state capacity in social service provision, especially in health and education, between 2000 and 2019. The central question the study will seek to answer is: In what ways has militarisation affected state capacity in social service provision in Zimbabwe between 2000 and 2019? Its objectives will seek to: a) understand the nexus between militarisation and state capacity in developing countries and; b) examine the dynamics and consequences of militarisation on state capacity in social service provision in Zimbabwe between 2000 and 2019. The study will be based on both primary and secondary sources.

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Entrepreneurial Orientation and SME Supply Chain Performance: The Mediating Effect of Innovation

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Keywords: Entrepreneurial orientation, SME, Supply chain performance, Innovation

Organisations seek to enhance their supply chain performance (SCP) as it allows better competitiveness and effective resource utilisation. The complexity of the current turbulent business environment requires small and medium enterprises (SMEs) to have an entrepreneurial mind-set in managing their supply chains [1]. This study examines whether innovation mediates the relationship between entrepreneurial orientation (EO) and (SCP) in the context of SMEs. Data is collected through an online survey from 250 SMEs in Zimbabwe. Structural equation modelling (SEM) with the SmartPLS is employed to test the hypotheses on the direct and indirect relationships of EO and SME supply chain performance through innovation. This study contributes to the growing literature on EO and SCP, while providing new insights into SME supply chain management decisions from a developing country's perspective.

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Water's Hidden Threat: Uncovering Antimicrobial Resistance and Key Genes in E. coli from Johannesburg Waters

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Keywords: Antimicrobial resistance, *E. coli,* Environmental water

The emergence of extended-spectrum β-lactamases (ESBLs) and carbapenemase resistant Enterobacteriaceae (CREs) has become a global concern [1]. Environmental water has been indicated as one of the potential sources for the dissemination of antimicrobial resistant (AMR) genes [2]. This study assessed the antibiotic resistance profile and investigated the presence of AMR genes for ESBL producers and CRE in pathogenic *E. coli* isolated from surface water of Johannesburg, South Africa. A total of 99 confirmed pathogenic *E. coli* isolated from nine water sources in Johannesburg were analysed by PCR. *Escherichia coli* were isolated from water sources using routine microbiological tests. Antibiotic susceptibility profile of isolates was determined using VITEK®-2 automated system. The presence of AMR associated genes was determined by PCR assays. Among the 99 pathogenic *E. coli* isolates investigated, the VITEK®-2 system identified a high percentage of isolates resistant to cefuroxime (100%), both ceftazidime and ampicillin (94%), cefotaxime (88%), cefepime (84%) and amoxicillin-clavulanic acid (82%). Imipenem, meropenem and ertapenem resistance were 74%, 62% and 59% respectively. At least 8% of the isolates were resistance to ciprofloxacin. Among the ESBL encoding genes screened, 53% of the isolates harboured bla_TEM, 36% bla_SHV and 17% bla_CTX-M1. The isolates harbouring CRE genes ranged from 2% to 63% of which bla_IMI was the most prevalent (63%) followed by bla_VIM (31.3%) and bla_OXA-51 (16%). Isolates harbouring both ESBL and CRE genes simultaneously were detected in 51.5% of isolates. This study reported the presence of multidrug-resistant (MDR) isolates in the environmental water of Johannesburg and revealed the presence of antibiotic-resistance genes (ESBLs and CREs) among *E. coli* isolates, with some carrying multiple AMR gene combinations. This confirms the circulation of MDR strains within the Johannesburg region. Community acquired MDR infections are thus a possibility and would be hard to treat empirically. More studies are required to monitor and prevent the spread of AMR in the region.

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Structural determination of S. mansoni Universal Stress G4LZI3 Protein by X-ray crystallography and in silico discovery of new anti-schistosomal compounds

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Keywords: G4LZI3, Schistosomiasis, Praziquantel

From a global health standpoint, schistosomiasis is the most severe water-based illness in tropical and subtropical regions of the world, affecting more than 252 million people [1]. Over 90% of affected populations are concentrated in sub-Saharan Africa where underprivileged groups often bear the brunt of this disease. Schistosomiasis exhibits a wide range of symptoms that progress into more serious side effects such as liver fibrosis, portal hypertension, and a propensity for bladder cancer. Despite its ancient origins, attempts to control and eradicate it have not been totally successful. Praziquantel, the only known chemotherapy agent to be effective against all schistosome infections, has been used in these attempts. However, growing worries over its unclear mechanism of action and reports of the emergence of drug-resistant strains due to prolonged mass administration for more than 50 years have justified the need to find new and more potent anti-schistosomal agents [2]. Through the up-regulation of universal stress proteins (Usps), schistosomes have evolved defence mechanisms to deal with the various stresses they experience throughout their developmental cycle [3]. The universal stress G4LZI3 protein has been identified as a potential 'lead' molecule in schistosomal treatment, hence the main aim of this study was to determine the 3D structure of this protein by macromolecular X-ray crystallography for its use in identifying potential small molecules that may inhibit its activity. *Escherichia coli* M15 cells were used to overexpress the G4LZI3 protein, which was purified to homogeneity using Ni-NTA affinity chromatography and gel filtration. Concentrated samples of the pure protein were subjected to crystallization and diffraction data was collected and analyzed remotely at the University of Cape Town from the Diamond Light Source (United Kingdom). MR_Rosetta Software tools were used for data processing and Coot was used for model building and refinement of the final structure, which contained four α-helices and four parallel β-sheets. Polyphenolic compounds have been shown in previous studies to inhibit USPs in organisms such as *Mycobacterium tuberculosis* [4]. This study, therefore, sought to ascertain the efficacy of these organic compounds against the G4LZI3 protein. Ten polyphenols were docked onto the structure of the G4LZI3 protein, after which molecular dynamic (MD) simulations were used to examine the conformational changes exhibited by the five complexes with the best docking scores. According to post-MD findings, formed complexes with curcumin and catechin displayed the highest binding energies. All the complexes contained conserved residues, which offers a road map for the development of novel inhibitors that may obstruct the function of the protein. The G4LZI3 structure was thereafter used to generate a pharmacophore, which identified three small molecules that have been shown to exhibit inhibitory effects on the protein. These results provide a basis for further investigation of the G4LZI3 protein towards the design of new anti-schistosomals.

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Abstracts

Oral Category

PhD GES/4IR

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Supervisor(s): Professor Kaushik Mallick

Oxygen vacancy defect engineering to promote the electrocatalytic detection of Epinephrine

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Keywords: Hybrid material, electrochemical sensing, mixed valance state, oxygen vacancy, epinephrine detection.

Carbon nitride supported titanium dioxide hybrid system (TOCN) was synthesized using a high temperature, in-situ, solid-state synthesis route. The X-ray photoelectron spectroscopy (XPS) analysis confirmed the composition and the oxidation state of the constituent elements. The high resolution XPS spectrum revealed the formation of mixed valance state of Ti4+/Ti3+ and the creation of oxygen vacancy in the system. TOCN was applied as a catalyst for the electrochemical and electrical detection of epinephrine which was further explored through a custom-made device in presence of PBS. The detection techniques were involved with cyclic voltammetry, square wave voltammetry and chronoamperometry studies. These results highlighted the ability of the TOCN hybrid system for sensors application.

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Investigating Physical Science pre-service teachers' inquiry practices within a Virtual Reality classroom: A Learning Analytics Approach

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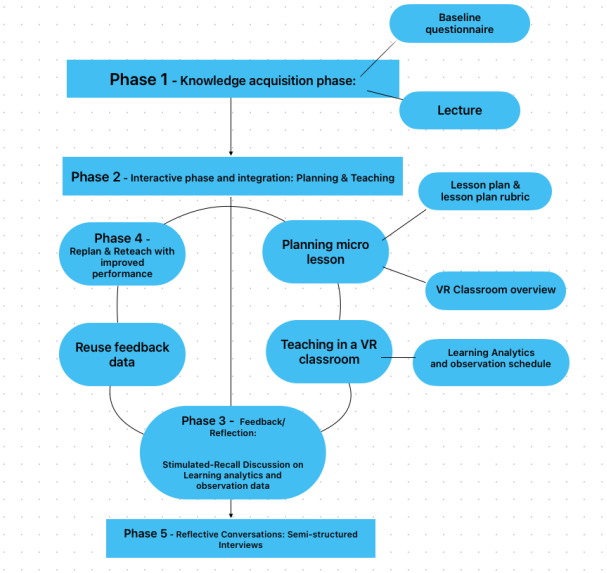
Keywords: Virtual Reality, Physical Science, pre-service teachers, Learning Analytics, Inquiry

Globally, there has been a recent significant increase in interest in pedagogical activity ties aligned with the Fourth Industrial Revolution (4IR). This significant increase in 4IR has promoted a necessity to provide technology-based training across different sectors, including education sector. This study aims to investigate Physical Science pre-service teachers' Inquiry practices within a Virtual Reality (VR) classroom using Learning Analytics. The study will use an explanatory sequential mixed-method research design with the aim of acquiring a more comprehensive understanding of the Physical Science pre-service teachers' attitudes, experiences and pedagogical practices utilised in a VR classroom to enforce inquiry practices.

Graphical Abstract



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Faculty: Health Sciences
Department: Laser Research Centre (LRC)
Supervisor(s): Professor Blassan George and Professor Heidi Abrahamse

Evaluation of Nano-Phytoformulations of Berberine Mediated Photodynamic Therapy on a Human 3D Lung Cancer Cell Model

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Keywords: Phototheranostics, Photodynamic therapy, Nanotechnology, Gold nanoparticles, Lung cancer, Berberine, Photosensitizer

Lung cancer is the second most common cancer in the world with the highest yearly fatality rate[1, 2]. Even while conventional treatment methods like radiotherapy, chemotherapy, and surgery are available, looking for changes to protocols and combining them with other techniques like photodynamic therapy (PDT) is a new strategy to enhance the treatment of lung cancer[3, 4]. During PDT, photosensitizer (PSs) agents absorb a certain wavelength of laser light and produce reactive oxygen species (ROS), which kill cancer cells[4]. The objective of our study was loading berberine (BBR) on liposomes (Lipo@BBR) as a new PS nanocomplex for PDT on A549 lung cancer spheroid cells. We hypothesized that Lipo@BBR would be helpful to target therapy of BBR and expected that Au NPs would have synergistic photo-thermal effects in PDT. Data indicated that BBR was loaded on liposomes at concentrations of 16 µM. When combined with a 405 nm laser at 15 J/cm^2 fluency this compound displayed phototoxic effects and reduced spheroid cell viability to 77.78%. Finally, in, the Lipo@BBR complex has a potent ability to be a photosensitizer in PDT at a safe dose and can also be considered as a photo-diagnostic tool to enhance cancer therapeutic outcome.

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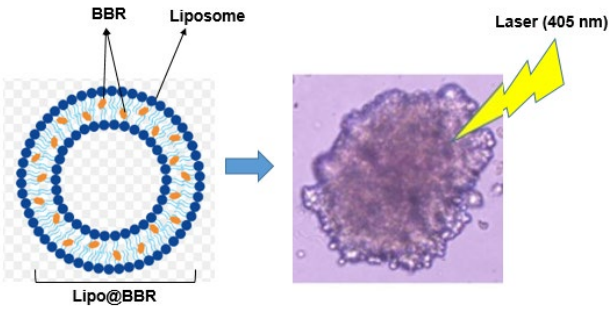
Graphical Abstract



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The development and affordances of AR tools for inquiry-based learning of metabolism in a university biochemistry module

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Keywords: Augmented reality, metabolic pathways, biochemistry education, Conceptual understanding, student motivation, mixed-methods research, immersive learning.

Studying metabolic pathways in biochemistry presents a significant challenge due to the complex interconnectedness of various biochemical reactions and pathways, requiring a deep understanding of intricate molecular interactions, enzyme kinetics, and regulatory mechanisms. This research study focuses on developing and evaluating augmented reality (AR) tools for teaching metabolic pathways in biochemistry at a South African university. The study is conducted in two phases, adopting a pragmatic paradigm and utilizing a mixed-methods research approach. AR tools are created and refined in the first phase with input from subject matter experts and instructional design specialists. These AR tools enhance student learning and engagement by providing interactive and immersive experiences that help visualize complex molecular interactions in metabolic pathways. The second phase involves working with second-year biochemistry students to investigate the impact of the developed AR tools. Data is collected through various methods, including conceptual tests, questionnaire surveys, and focus group interviews. The conceptual tests assess students' understanding of metabolism before and after using the AR tools, allowing for an evaluation of their impact on conceptual comprehension. The questionnaire survey provides quantitative data on student motivation, attention, perceived relevance of the AR tools, and satisfaction with the learning experience. Focus group interviews offer qualitative insights into students' experiences, perceptions, and attitudes toward the AR tools. The outcomes of this study will address the conceptual challenges inherent in biochemistry education through innovative AR tools and will shed light on the role of technology in higher education. The findings of this study will contribute to the growing body of knowledge surrounding the integration of AR tools in practical biochemistry education specifically. Educators and curriculum developers will gain valuable insights into the potential benefits and challenges associated with the adoption of AR tools, thereby fostering a more engaging and effective learning environment. This research embodies the transformative potential of technology in education and underscores its role in shaping the future of biochemistry pedagogy. Ultimately, the research aims to create a more engaging and effective learning environment for students studying metabolic pathways in biochemistry.

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A sustainable agriculture in a digital age: computational metabolomics to study chemical interactions between maize plants and rhizobacteria

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Keywords: 4IR-inspired computational tools, metabolomics, rhizosphere communication, maize, *Bacillus*

To achieve a sustainably productive agriculture, towards the UN SDG #2, innovative and sustainable strategies are needed [1]. These include a deconvoluted exploration of plant biostimulants, such as microbial formulations [2,3]. This can be rendered possible by advancing our understanding of plant-microbe interactions. Belowground plant-microbe relationships are dynamic and complex interactomes involving microbial diversification, speciation, structural complexity, root systems and other physicochemical and biological components [4]. One of the key drivers for these intertwining plant and microbe associations are chemical intercommunications, which remain poorly understood. Such knowledge gap limits the exploration and use of microbial formulations in cropping practices, designing sustainable ecosystems that are beneficial, stable and productive. Thus, to contribute to ongoing efforts to decode the belowground elements of plant-microbe chemical communications, in this work, computational metabolomics, involving 4IR-inspired and digital technologies and strategies, was applied to (i) interrogate the extracellular metabolome of *Bacillus* species and (ii) to elucidate metabolic changes in the rhizosphere of maize plants treated with the *Bacillus*-based formulation. The results revealed that the metabolome of the *Bacillus is* characterised by various molecular families such as lipids and lipid-like molecules, benzenoids, organic oxygen compounds, organic acids, and derivatives. Lipopeptides and macrolactins involved in the plant-microbe intercommunication, were found to be key discriminating metabolites in the extracellular metabolome of *Bacillus*-based formulation. The rhizosphere metabolomics showed that the microbe-plant interactions are facilitated by a complex and dynamic chemical communication involving differential changes in various (rhizo-) metabolites such as benzoxazinoids, malic acid and amino acids. Decoding this chemical language deepens our understanding of the mechanisms of action mediated by *Bacillus*-based formulations. Such actionable insights are critically essential for biostimulant industry and agriculture sector to improve growth, yield, and disease reduction, for sustainable global food security.

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Leveraging machine learning to unveil phenological flowering patterns in South African National Botanical Gardens through public databases

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Keywords: Plants, Flowering, Machine Learning, Phenology, Biodiversity

Phenological patterns, representing the timing of recurrent biological events, such as flowering, are essential for understanding plant life cycles, ecological interactions, and how species respond to climate change [1]. However, given the diversity of South African flora (ca. 24,000 species) [2], manually recording species phenology presents an immense challenge. In this study, we explore machine learning (ML) application to data sourced from the iNaturalist database and describe the flowering phenology of plants in the South African National Botanical Gardens. We generated a training dataset from 10,000 photographic images, encompassing a diverse range of species from various locations. Next, we applied a Convolutional Neural Network (CNN) to classify images as flowering versus non-flowering. Using metadata associated with each image, including the date the photograph was taken, we were able to derive the timing of peak flower production and length of the flowering season for each species in the database. Our analysis illustrates how ML can leverage the vast wealth of citizen science biodiversity data in South Africa and describe large-scale phenological dynamics across the region. Applying ML and other advanced data tools to big data provides an opportunity for more informed decision-making and sustainable practices in the context of biodiversity conservation and management.

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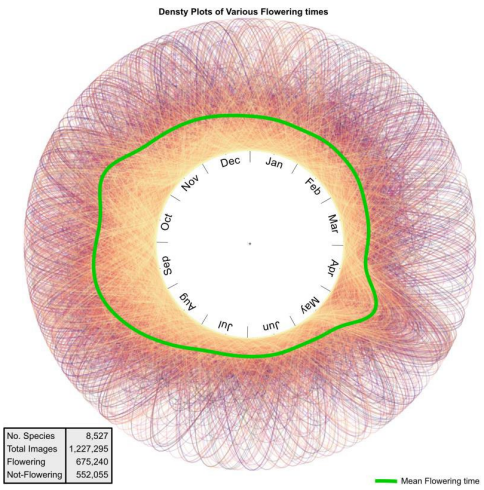
Graphical Abstract



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The legal implications of the use of artificial intelligence in a risk-based approach to client due diligence in terms of the Financial Intelligence Centre Act

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Keywords: Anti-money laundering, combating financing of terrorism, client due diligence, know your client, risk-based approach, artificial intelligence, FICA

Anti-money laundering and the combating of the financing of terrorism (AML/CFT) has led to legislative interference in the establishment and maintenance of business relationships. The financial Intelligence Centre Act as amended requires accountable institutions to apply a risk-based approach to client due diligence when establishing business relationships and on an ongoing basis to protect their businesses from crime. In this 4th industrial revolution artificial intelligence has made great inroads in how businesses are conducted. The financial services sector has not been spared. The research thus sought to interrogate how artificial intelligence is being used in a risk-based approach to client due diligence by accountable institutions and the legal impact it has in that regard.

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Cell Death Mechanisms Induced by Green Synthesized Silver Nanoparticles in Combination with Pheophorbide-a Mediated Photodynamic Therapy Against Resistant MCF-7 Cells Overexpressed with P-Glycoprotein

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Keywords: Cancer, *Dicoma anomala*, green silver nanoparticles, pheophorbide a, photodynamic therapy, apoptosis, necrosis

Globally, multidrug resistance (MDR) in breast cancer has become the major cause of morbidity and mortality among women [1-2]. This study was designed to overcome resistance, reduce dose-dependence in photodynamic therapy (PDT) and evaluate cell death mechanisms induced by green synthesized silver nanoparticles (AgNPs) in combination with pheophorbide-a mediated PDT on superlative, and most architectured three-dimensional (3-D) doxorubicin (DOX) resistant MCF-7 breast cancer cells with overexpressed p-glycoproteins in vitro. In addition to the aforementioned scope, the combination of green NPs with PDT has been reported to yield a good disease prognosis which in most cases is accompanied with manageable adverse effects. Briefly, MDR MCF-7 breast cancer cells were cultured in a 96 well plate to form 3D tumor spheroids and later treated with optimized concentrations of AgNPs and pheophorbide-a in monotherapy. After 24 h treatment, 3- [4,5-dimethylthiazole-2- yl]-2,5- diphenyl tetrazolium bromide (MTT) assay was performed to determine the 50% inhibitory concentration (IC50) for both experimental models. Morphological changes were observed by using an inverted light microscope, viability by MTT assay, and cell death analysis by Annexin V-FITC-PI staining. Taken together, the results from this study displayed adose-dependent decrease in cell viability which was accompanied by significant morphological changes. Furthermore, Annexin V-FITC-PI assay showed apoptosis as the most prominent cell death mechanism induced by PPBa-mediated PDT and AgNPs. Taken together, the findings from the present study highlight the advantages of green nanotechnology in cancer therapy.

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Critical Issues Hindering the implementation of digitalization in the insurance industry of South Africa: The application of Delphi Technique

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Keywords: Delphi technique, Digital insurance, Insurance digital transformation, Insurance Technology, Insurance 4.0

To achieve a fundamental transformation in today's new setting, tackling the changing competitive dynamics is vital. Insurance companies need to develop highly specialized expertise that will allow them to provide value in a distinctive way, collaborate with digital ecosystems, and address some of the issues facing the sector. The insurance industry has evolved into a hub of digital innovation because of FinTech investments and InsurTech businesses [2]. To improve the customer experience, partners, organisation employees and other stakeholders, insurers need to embrace disruption and reimagine their business models to transition to a secure, compliant, and digitally connected operating model [1]. The insurance industry plays a crucial part in the global economy, the sustainability of the economic system, and its sustainability. The main goal of this research is to determine and understand the critical factors that are hindering the implementation of digitalisation in the insurance industry of South Africa. The Delphi technique was used in the current study because of its flexibility and efficiency as a decision-making tool. Designers and decision-makers make use of it frequently to reach informed business decisions in all areas of management. In the current study, 16 experts in the field were involved in identifying and approving the crucial factors that affect the adoption and implementation of digital insurance.

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Supervisor(s): Professor Kaushik Mallick

Ultrafine bismuth phosphate particles for asymmetric supercapacitor application

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Keywords: Asymmetric supercapacitor, Bismuth phosphate nanoparticles, Monoclinic structure, Oscillator

Ultrafine bismuth phosphate particles (monoclinic phase with the space group of P21/n) were synthesized using a wet chemical complexation method and applied for supercapacitor application [1]. For the three electrode application, the synthesized material exhibited a specific capacitance value of 177 F.g-1 at 2.5 A.g-1 on a Ni-foam based electrode. An asymmetric supercapacitor was fabricated with bismuth phosphate and carbon nanotubes as positive and negative electrodes, respectively, which achieved a specific capacity of 990 mAh.g-1 at 0.08 A.g-1. The energy and power density values of 0.09 Wh.kg-1 and 464.28 W.kg-1 were obtained at 0.83 A.g-1. The asymmetric supercapacitor has the potential in oscillator application [2].

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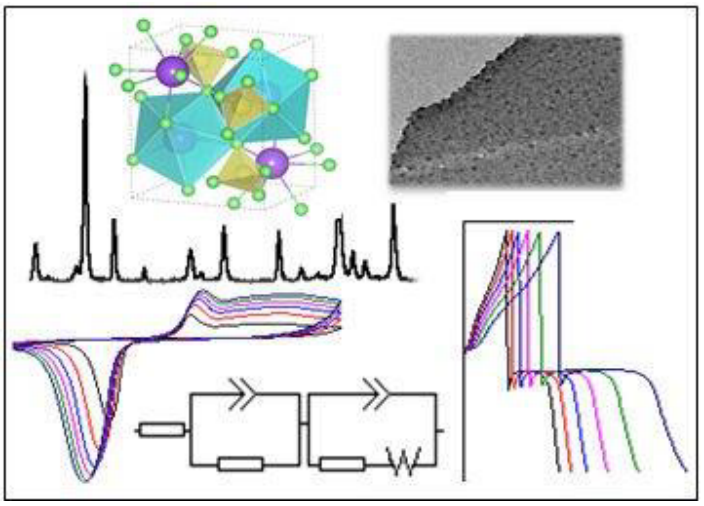
Graphical Abstract



Abstracts

Oral Category

PhD General

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Water beetles as indicators of climate change vulnerability in South African freshwater ecosystems

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Keywords: Climate change, water beetles, thermal tolerance

The rapidly changing climate is a global phenomenon which is expected to have severe impacts on our water resources in South Africa [1]. However, specifics regarding the nature and extent of these effects on aquatic ecosystems have not been adequately investigated [2]. Macroinvertebrates are one of the best-known indicators of environmental change in freshwater ecosystems [3], and within this group, water beetles show promise as indicators of thermal stress. One of the broader aims of this study was to investigate the thermal tolerance of water beetles from freshwater environments of two biogeographically distinct regions of South Africa. The study has assessed the vulnerability of aquatic fauna to climate change by assessing the relative thermal sensitivity of the water beetle taxa sampled.

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Religious Syncretism in Contemporary African Literature

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Keywords: African indigenous spirituality, African religion, contemporary literature, myth, memory, African cosmology, postcolonial literature

In this paper, I examine how contemporary African novels erase polarised representations of African indigenous religions and Christianity to portray an amalgamation of these two religions and their cultural worldviews. In religious studies, this concept of religious syncretism is well-established, but it is not the same in literary studies, especially in terms of how novels examine and portray the phenomenon in contemporary African cultural contexts. Even when Christianity is examined as an African religion1, it is generally contrasted with African indigenous religions to the extent that, depending on the perspective, either side is villainized against the other. The novels that I study, however, represent African indigenous religions and Christianity as integrated and often interdependent. Additionally, these novels do not represent religion and spirituality as inconsequential. Rather, as William Ackah suggests, these novels understand these concepts as more than '[vessels] to be used to interrogate issues of class, culture, race, gender, and/or sexual orientation' but as 'powerful [elements] in [their] own right'2. By examining the representations of religious syncretism in contemporary African novels, my study hopes to underscore the process of 'reversal and emergence'3 that is unique to African contemporary literature as it is to syncretism, a concept associated with hybridity 'through ongoing processes of synthesis and erasure'4. What the novels in my study observe is that 'it is not necessary to disown one's own [African] heritage to be a good Christian – just as

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Field hockey coaches' perceptions and knowledge regarding concussion – providing a framework for coach education to enhance management of field related concussion injuries within the South African context

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Keywords: Sport related concussion, Injury Management

Field hockey, despite not being classified as a contact sport, has a high risk for sports related concussion (SRC) injuries. This is primarily due to the speed and intensity of the game, rules, field surfaces and equipment. Head injuries are a commonly reported injury, with up to 75% of concussions being unreported or undetected. The research was conducted within the Gauteng province, with a cohort of coaches (n= 18) coaching teams in a provincial premier league. The modified RoCKAS-ST (2009) [1], questionnaire was used to measure attitudes and knowledge regarding concussion, followed up with interviews (n=3). Coaches reported having witnessed between 1-5 concussions (March 2018 to March 2022), with 89% able to identify signs and symptoms of concussion. However, 61% felt that their concussion knowledge was not sufficient to be able to deal with a SRC injury. Within the coach education for South African field hockey coaches, there is no information dealing with signs and symptoms of concussion or management thereof. The concussion education programmes implemented in rugby have shown to decrease severe injuries and improve injury prevention behaviours [2]. Introducing a framework, embedded within the coach education, for the field diagnosis, reporting and management of SRC injuries will empower coaches who are predominantly the first responders to such injuries. This aims to enhance the management of SRC injuries, ensuring improved safety during training and competition for field hockey players.

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The use of e-resources in the teaching and learning of 'O' Level English Language in Zimbabwe: challenges and opportunities

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Keywords: Electronic resources, Covid-19, Online learning, blended learning

The lockdowns induced by the Covid-19 pandemic, which then imposed online learning, exposed the inadequacies in the education system in Zimbabwe regarding digital resources for language teaching and learning, especially in respect of English. This was largely due to ill-equipped personnel as well as the unavailability of teaching and learning materials online to enable effective virtual English Language teaching and learning. With the advent of technology there is a need to ensure access to the same technology for learners across the rural-urban divide as the learners will sit for the same examination at the end of the syllabus. The integration of ICT in teaching and learning is still at the early stage in the education systems of most developing countries [1]. This research intends to explore the use of electronic resources in the teaching and learning of 'O' Level English Language in Zimbabwe and identify the challenges and opportunities associated with their use. E-learning technologies enhance knowledge exchange between the students and the teachers and strengthen communication channels, resulting in improved performance [2]. The research aims to suggest a standardised framework that focuses on storage and use of e-resources to enable their full utilisation. The research will be guided by the Technology Acceptance Model (TAM) and its modifications as well as the Unified Theory of Acceptance Model (UTAUT). The two will be used to ascertain whether each of their variables influences the use of e-resources in English Language teaching in Zimbabwe and ultimately aid in raising the pass rates.

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An integrated framework for talent management in digital banking

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Keywords: talent management, digital technologies, talent management value chain, digital human capital function, strategic business partnering, digital banking

The purpose of the present study was to develop an integrated framework for talent management in digital banking that will enable the workplace of banking to appropriately respond to and implement talent management practices that are aligned to the new digital workplace affected by digitalisation [2;3;5]. The study was motivated by the evolution of the human capital function underway in banking affected by digital technologies [6;7]. The new digital workplace of banking requires a new approach towards talent management and requires a reimagined human capital function delivery driven by technology to effectively transform and thrive in the digital era [1;4]. The present study employed a qualitative approach and conducted the study in a "Banking Corporation". The study found that digital technologies had implications for the talent management value chain within banking and brought transformation to talent management processes and practices giving rise to a new talent management approach [8;10]. Additionally, the study found that a reimagined human capital function delivery was required from the human capital function and human capital professionals [9]. The human capital function delivery was required to encompass a digitised human capital function, human capital as a strategic business partner and further human capital as a change management leader by partnering with business leaders to lead the digital transformations in the workplace of banking [9;10]. Thus, the developed integrated framework for talent management makes a direct contribution to the human capital function, human capital professionals, leaders, and talent management in the world of banking.

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Opuntia ficus indica mucilage coating extended shelf-life of bananas by enhancing the antioxidant defence systems: A sustainable postharvest strategy

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Keywords: Reactive oxygen species (ROS); food security; edible coatings; profitability

This research explored the potential of Opuntia ficus indica mucilage (OFIM) as an edible coating to improve antioxidant defence systems and extend postharvest life of banana fruit. The trial used a factorial design with treatments of untreated bananas and bananas coated with 1%, 2%, and 3% OFIM. Findings indicate that OFIM coating notably improved banana shelf life by six additional days compared to uncoated fruit. OFIM edible coating enhanced antioxidant defense systems and suppressed PPO and POD activities which led to higher TPC, TFC and AA hence reduced oxidative damage by ROS. Overall, OFIM is a promising cost-effective and environmentally friendly postharvest strategy for banana producers to reduce postharvest loss and food waste and promote food security in commercial market.

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Is the politics of Monitoring and Evaluation a necessary evil? An ethnography of Community-Based Natural Resources Management programs in Western Uganda

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Keywords: Monitoring and Evaluation, Community-Based Natural Resources Management, politics, wildlife protected areas

In Western Uganda, government and non-governmental conservation organisations implementing Community-Based Natural Resources Management (CBNRM) programs in wildlife-protected areas (PAs) and adjacent communities apply M&E to track its progress. They involve several stakeholders including local governments, leaders, and communities in CBNRM implementation and M&E. According to [1], different stakeholders often have different conceptions of what to measure in a project and how, making M&E a political enterprise. This study aimed to understand how politics influences M&E in Western Uganda and how it is applied in politicking. The key research questions were: How is the politics of M&E practised? What are the implications of the politics of M&E on organisations and CBNRM management in Western Uganda? How should conservation organisations in Western Uganda deal with the M&E politics? Data was collected from the Uganda Wildlife Authority (UWA), the government conservation organisation responsible for wildlife PAs, and three non-governmental conservation organisations supporting CBNRM in Western Uganda. This qualitative research used an ethnographic strategy following nine months of participant observations, document analysis and in-depth interviews. This study finds that conservation organisations supporting CBNRM in Western Uganda use M&E to practice donor compliance politics, primarily conforming to the politics of aid, using it to make donors happy. M&E supplies the information donors require, with little on program performance that resonates with organisations and local communities. Locally, M&E politics is practised in Natural Resource Management (NRM) in PAs in Western Uganda—for instance, UWA funds local governments to do M&E for community revenue-sharing projects. However, M&E is not conducted, and no M&E reports are written yet funded regularly to enhance collaboration for NRM politics. Local political leaders use M&E information to politick. On the one hand, when M&E information reveals few project beneficiaries, they complain that the PAs are not benefiting local people. On the other hand, when many beneficiaries are reported, they claim they work with conservation organisations to ensure local people benefit. M&E politics determines the kind of M&E organisations contemplate; one that is designed to respond to some powerful interest, such as donor information needs, but rarely designed to meet local information needs. According to [2], persistent exclusion and denial of the importance and presence of political issues in M&E may undermine its accountability and learning functions. Therefore, it is a necessary evil that requires genuine attempts to deal with. To do so, organisations must retain control of M&E processes at every stage.

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A Biokinetics Sports Injury Prevention Model: Lessons learned from rugby and long-distance running

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Keywords: risk factors, injury prevention, union rugby, long-distance running

Although participation in physical activity is crucial for maintaining health and wellness for all human beings, all activities have an inherent risk for injury and in some cases may lead to temporary injury, permanent disability or even death (Kraus, Powell, Haskell et al., 2019). Participating in sport is both physically and mentally challenging and injuries result when the physical load placed on the body exceeds a certain threshold (Langeveld, Coetzee & Holtzhausen, 2012). The prevention of all sports injuries is impossible, however if the risk of sports injuries could be decreased or if their severity could be lessened, the negative impact of sports injuries on athletes, teams, coaches and society in general, will be lessened (Klügl, Shrier, McBain et al., 2010). The aim of this research was to develop a Biokinetic model for the prevention of sports injuries, primarily lessons learned from rugby and long-distance running. Biokinetics is a profession that originated in South Africa and its focus is using exercise as a therapeutic modality within the fields of orthopaedics, chronic disease and health promotion. The study utilised a sequential qualitative design. Phase one consisted of a scoping review which was conducted to determine the prevalence and risk factors of rugby and long-distance running injuries and injury prevention programmes currently available. Thereafter, three rounds of the Delphi method were conducted, where participants (n=22) were requested to identify injury prevention strategies and practices. The results were utilised to draft an initial injury prevention model, whereafter it was presented to the participants for the fourth round of the Delphi method for scrutinising. Amendments were made to the model from the feedback by the participants and the model was presented to athletes, coaches and medical professionals. Participants were invited to semi-structured focus groups where they were required to provide comments on practical implementation of the model. The finalisation of the model commenced after the focus groups' data were analysed and implemented. The study included various participants for the different phases, including provincial rugby players, long-distance runners, coaches, biokineticists and other healthcare professionals. Various quantitative and qualitative analyses took place during the different phases. Descriptive statistics (means, standard deviation and percentages) and data extraction were conducted to analyse the quantitative data that arose from the scoping review. Thematic, inductive analysis was utilised for the qualitative data derived from the Delphi method and the focus groups. The developed Biokinetics model for the prevention or reduction of various sports injuries, can be used in the field of biokinetics, sport science and sport coaching in both team and individual sports. The model includes various dimensions of injury prevention, including pre-participation screening, education of the athlete, coach and conditioning team, and intervention strategies. The intervention strategies are seen as a menu from which the stakeholders can choose from to create their own prevention strategies, to suit the needs of the athlete and/or coaching staff. The model can be used as a guideline to develop a tailor-made programme to prevent or reduce sports injuries.

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Curriculum implementation during times of crisis: The case of the business studies curriculum recovery plan during the Covid-19 Pandemic

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Keywords: Crisis, Curriculum implementation, Deep learning, Epistemology

The United Nations Children's Fund (UNICEF, 2021) reported that the Covid-19 pandemic cost most South African schools 54% of learning time. The department of basic education (DBE) designed a curriculum recovery plan (CRP) for all subjects to address the loss of learning time. This qualitative study examined Business Studies educators' attention to conceptual learning in the implementation of the Business Studies CRP. The research focused on “How are teachers, DHs, principals, subject advisors, and curriculum designers, enabling and supporting conceptual learning of the Business Studies CRP during the Covid-19 pandemic?" The present study is situated within the recovery phase of the crisis continuum [1]. The study was informed by Chow, Lam & King's (2020) Crisis Resilience Pedagogy framework, Rogan & Grayson's (2003) theory of curriculum implementation in developing countries, and McPhail's (2020) deep learning framework. Data was collected through, document analysis, semi-structured interviews, and observations, and analysed through thematic analysis approach. The data analysis revealed crisis resilience pedagogical components. First, redesigning the DBE website for usability, including post-Covid-19 subject teaching materials, safety policies, homeschooling guidelines, instructional videos showcasing modern teaching methods, reading-promoting novels displayed "adaptability". Second "creativity" was observed through the use of innovative approaches, including the development of age-appropriate remote learning activity books, podcasts, interactive quizzes, updated textbooks, and the usage of the Google Forms monitoring tool. Third "connectivity" was demonstrated via subject-specific WhatsApp groups that connected learners, parents, and teachers with subject advisors. Microsoft Teams and Zoom were utilised for regular meetings with local and international stakeholders, paired with emails. Diversity was demonstrated by the use of text-based, verbal, and video-based instructional strategies that catered to the different needs and learning styles of learners. Endurance was also evident as participants continued teaching in challenging educational environments. DHs assessed learners with comorbidities at home to gauge their learning progress. Subject advisors intervened and provided instructional support in schools with serious academic decline. The participants' epistemological beliefs underwent a noticeable transformation – for the first-time content was trimmed and accepted by teachers. The COVID-19 pandemic posed significant obstacles to fostering in-depth conceptual learning in the classroom. Identifying key concepts and using teaching strategies to improve learners' conceptual understanding posed a challenge. As a result, teachers placed a higher emphasis on ensuring the completion of the syllabus and preparing learners for assessments. Adequate support structures were put in place to support curriculum implementation during the pandemic, however, psychological/mental support strategies lacked. Participants faced various obstacles such as an inadequate ICT infrastructure, insufficient teacher training in online instruction, restricted teacher involvement in the development of the Business Studies CRP, limited time allotted for prescribed content, decreased learner motivation, and increased absenteeism. The study provided recommendations to study participants, and the DBE. Based on the findings, a Crisis Curriculum Implementation Guide (CCIG) model was created to improve Business Studies curriculum delivery during crisis.

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Taxation in the Rural Resilience Game: How Southern Africa Can Foster Capacity to Withstand Climate Change-Induced and Environmental Disasters through Tax

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Keywords: Climate change, Taxation, Disasters, Southern Africa, resilience, revenues

The Research sought to assess the role of taxation as a mechanism to enhance the capacity of Southern Africa to build resilience to climate change and environmental disasters. This stems from the backdrop that taxation is recognized as a strong pillar in providing financial resources in development planning [1]. To that end, the study sought to assess the potential of tax resources to strengthen the capacity of Southern Africa to mitigate the effects of climate change and environmental disasters. The study applied a critical documentary review to understand the research problem. The study selected academic journals from the JSTOR database, Google Scholar, Scopus, Taylor and Francis, national legislative frameworks, international reports, and other publications in the collection of data for the study. The study found that carbon taxation has been one of the taxes used by Southern African countries to foster resilience to climate change in different countries [2]. However, the performance of the tax has remained elusive, considering the minimum emission reductions required for countries to contribute towards effective climate action across the globe [3]. Further, many Southern African countries are missing a tax policy and an enabling act of parliament that is solely designed to mobilize funding for climate action [4]. Therefore, the study recommends that there is a need for a tax policy and an act of parliament that explicitly provides the need for tax systems to foster effective resilience of countries like Zimbabwe to climate change and environmentally induced disasters. There is a need for collaboration and interoperability between the government of Zimbabwe, its ministries, and other partners to ensure a collaborative effort in enhancing resilience to climate change and environmentally induced disasters. Through the Ministry of Lands, Agriculture, Water, Rural Resettlement, and Climate Change, the government should develop clear, measurable targets for effective resilience to climate change. Resources from the carbon tax and other tax systems that are meant for resilience to climate change should be directed to the purpose through strict monitoring and oversight to see through the effectiveness of taxation towards the strength of Southern African countries to climate change and environmentally induced disasters.

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Abstracts

Oral Category

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Knowledge, attitudes, and practices on indoor residual spraying as a Malaria control intervention amongst residents of Shakawe and Xakao in Botswana

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Keywords: Indoor Residual Spraying, Uptake, Knowledge, Attitude, Practice, Consent, Malaria

Indoor Residual Spraying (IRS) is the application of a residual insecticide to Malaria vector resting surfaces of all houses or structures where such vectors might come into contact with the insecticide [1]. The success of IRS relies on how the communities view and embrace it [2]. Individual factors like socio-demography, knowledge, attitude and practices of heads of households are associated with a willingness to accept/not accept IRS [3]. The aim of the study was to determine the knowledge, attitudes and practices of the residents of Shakawe and Xakao (Botswana) associated with the uptake of IRS. The study was conducted in Xakao and Shakawe, villages located in the Okavango district, which has the highest Malaria prevalence in Botswana while continuously record incompatible IRS uptake levels [4]. A cross-sectional survey design was chosen with sample size of 395 households determined, using EPINFO version 7.10. SPSS statistical software, version 28, was used to capture and analyse the data. Descriptive data was presented in graphs, charts and tables. Correlation and regression analyses were conducted to determine the association between the dependent and independent variables. Adjusted odds ratios were used to draw inferences from the findings. A 96% response rate was obtained for the study, with more female respondents (67.1%) than male respondents (32.9%). Respondents in Shakawe (66.2%) and Xakao (66.4%) fell mostly between 20 and 50 years of age. 89.76% of the respondents earned less than P2000.00 per month, with 53.1% of the them not formally employed. 96% of Shakawe respondents, compared to Xakao (63%), were knowledgeable about IRS. 38% of Shakawe respondents demonstrated positive IRS associated attitudes, compared to Xakao with 56%. 91.4% of the respondents demonstrated good IRS associated practices, 7.8% satisfactory practices and 0.8% poor practices. The results also indicated that there were 1.816 odds of residents with good practices (OR 1.816, 95% CI (0.58 – 3.74)), 2.797 odds of knowledgeable residents (OR 2.797, 95% CI (0.634 – 12.344)) and 2.514 odds of residents with good attitude (OR 2.514, 95% CI (1.143 – 5.53)) accepting IRS. Of the three variables, attitude had a significant association (p=0.001) with the uptake of IRS. Confounding variables, including age and socio-economic status, had an insignificant association with the respondents' IRS uptake decisions. The study communities were shown to be homogenous despite their uptake differences. Regular and meaningful assessment of the knowledge, attitudes and practices of the target communities must be conducted so as to promptly identify and respond to intervention fatigue, ambiguities in understanding the intervention brought about by poor communication and alternative media and general misconceptions about the intervention.

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Evaluating digital integration influences of intergenerational reliance on digital communication tools for workplace productivity post COVID-19 in Lesotho

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Keywords: strategic communication; digital integration; intergenerational communication; COVID-19; digital communication technologies

COVID-19 disrupted the world in an indisputable way, where the world does not have normal anymore, however the disruption has had its benefits and its disadvantages. For most organizations, the advantage is that they were forced to accelerate digital integration across their employee cohorts (1. Almeida, Santos, & Monteiro, 2020). Despite the benefits of digital integration, there is a gap in how organization can overcome challenges of implementing digital integration, and its influences on intergenerational reliance on communication channels including MS Teams and Zoom, for example, post COVID-19 (2. Ahmed, Farooq, & Janjua, 2021; 3. Hawash & Lang, 2020;). The aim of this research is to access the accelerated digital integration, its influence on workplace productivity among intergenerational professionals with increased reliance on communication tools such as MS Teams to increase work productivity, particularly during COVID-19. Digital integration is the process whereby organizations incorporate digital technologies to enhance efficiency and productivity (1. Almeida et al. 2020; 2. Ahmed et al., 2021). While studies have explored digital integration, a few have explored the strategic communication challenges of accelerated digital integration among a diverse intergenerational professional cohort, and the strategies companies take to overcome them. This study will take a quantitative approach, through a questionnaire administered to intergenerational professionals working in Lesotho, employing stratified random and snowball sampling for data collection that will be statistically analysed. The study intends to contribute to understanding the intergenerational communicative patterns among professionals in post COVID-19 in response to accelerated digital integration in their organisation, and whether there are differences in the expected positive correlation between digital integration and organization innovation.

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Quantum chemical studies on antiviral drug – An insight into antimicrobial resistance

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Antimicrobials have been hailed as the most important discoveries in medical history. This is due to their many success stories in the treatment of a myriad of diseases[1]. The gains that have been achieved by the use of antimicrobials have been threatened by the development of resistance posed by a set of diseases [2]. Antimicrobial resistance (AMR) was directly responsible for an estimated 1.27 million deaths in 2019, according to the most comprehensive global analysis of the issue to date [3]. To address Non-Nucleoside Reverse Transcriptase Inhibitors (NNRTIs) drug resistance, this study is aimed at applying computational chemistry techniques such as molecular dynamics, molecular docking and quantum mechanics using Gaussian 16 C01 and Gaussview 6.0 [4,5].

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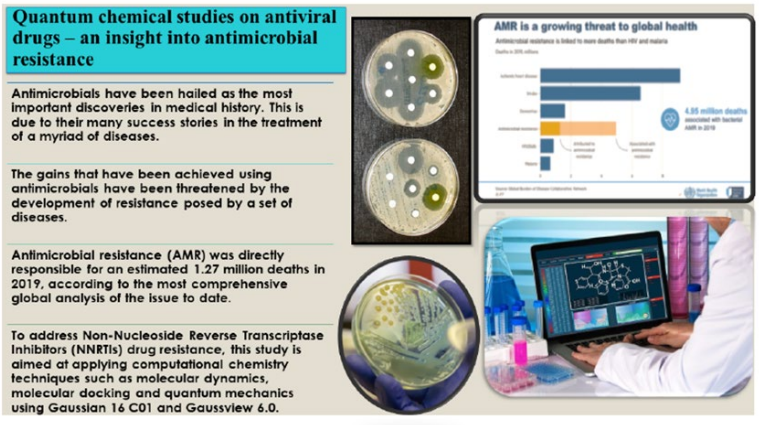
Graphical Abstract



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Valorisation of pomegranate processing waste for the synthesis of ZnO nanoparticles: antioxidant and antimicrobial properties against food pathogens

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Keywords: Zinc oxide nanoparticles, pomegranate waste, antioxidants activity, antimicrobial

The sustainable management of food waste is a pressing concern, with fruit waste valorization emerging as a viable strategy to address this challenge [1,2]. This study investigated the potential of pomegranate fruit peel waste (PPW) and pomegranate seed waste (PSW) as mediating agents for the synthesis of zinc oxide (ZnO) nanoparticles (NPs) [3] for potential utilization as additives in various polymer matrices for food packaging materials [4]. The physicochemical properties of the biosynthesized ZnO nanomaterials from pomegranate peel (ZnO-PPW) and seeds (ZnO-PSW) were characterized using XRD, UV, TEM, SEM, FTIR and EDX. The XRD results align well with existing literature, confirming a wurtzite crystalline structure of ZnO NPs [3]. TEM and SEM analysis showed a similar spherical shaped structure. However, ZnO-PSW, had a smaller size (57.72 nm) in comparison to ZnO-PPW (59.48 nm). Also, the estimated minimum inhibitory concentration at 50% (IC50) for both DPPH and ABTS are 2.97 and 2.57 mg/mL for ZnO-PPW; and 3.43 and 3.33 mg/mL for ZnO-PSW, respectively. Moreover, ZnO-PSW demonstrated superior antimicrobial activity against five foodborne microorganisms, attributed to its larger surface area due to its smaller size [5]. These findings suggest that pomegranate waste derived ZnO NPs could be beneficial for developing active food packaging materials.

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Uptake of lead (Pb) by Escherichia coli BL21 (DE3) cells genetically engineered with a pbrD gene

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Heavy metals are a serious environmental concern in most developing countries [2]. In South Africa, increased levels of lead (Pb) exceeding the acceptable limit of 10 µgL-1 have been reported in rivers [1]. Strategies employed to reduce the concentration of Pb from freshwater resources are currently non-specific and inefficient calling for an alternative method for the removal of Pb and other heavy metals from freshwater [3]. The aim of the study is to evaluate the biosorption of Pb from water using whole cells of an Escherichia coli based biosorbent genetically engineered (GE) with a Pb specific metalloprotein gene pbrD. To achieve this, polymerase chain reaction (PCR) will be used to confirm presence of the pbrD gene in E. coli BL21 (DE3) previously transformed with pET32 Xa/Lic/pbrD. The genetically engineered cells will be propagated and analysed for the uptake of varying concentrations of lead by ICP-OES and immobilized on electrospun cellulose acetate – poly [ethylene oxide] (CA/PEO) nanofibers and characterised using Scanning Electron Microscopy (SEM). The lead biosorption capacity of the immobilized GE E. coli BL21 and its adsorption mechanism will be analysed and the reusability of the immobilized GE E. coli BL21 cells on the repeated uptake of lead (Pb) will be evaluated. Positive findings from this study will be used to further develop the nanofibrous membrane as a coating for water filtration systems and be scaled up into a pilot study in order to test its application for water treatment.

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Handmade versus Computer – aided orthoticsfor realignment of pes planus: A comparative study.

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Keywords: Computer aided design/manufactured (CAD-CAM) orthotics, Handmade orthotics, Functional pes planus, Foot Realignment, Orthoses therapy

Amongst various treatment options available for functional pes planus, custom foot orthoses are currently recognised as the gold standard of treatment [1]. Anecdotal evidence suggests most podiatrists in South Africa prescribe and/ or are manufacturing traditional handmade orthotics as compared to computer-aided design/ manufactured (CAD-CAM) orthotics for the realignment of functional pes planus deformity. This advanced technology is costly in South Africa and is limited by the suppliers as most suppliers are based abroad. A critical drawback of CAD/CAM systems in South Africa is that they are generally expensive given the small group of specialized podiatrists they are aimed at. Literature describes CAD/CAM orthotics to provide greater accuracy, increased quality, a less wasteful process, and most importantly, provides a faster turnaround time, benefitting the patient [2]. The traditional approach of manufacturing is an unpleasant experience for patients, it frequently requires the process to be repeated if the orthotics have a poor fit on the foot. The manual fabrication process of custom orthoses is time consuming and causes material wastage [3]. However, the biggest drawback of this method is that it requires extensive technical ability, which is not consistent among podiatrists and might lead to the risk of manufacturing errors and poor orthotic fit. Several studies highlight the efficacy of CAD-CAM orthotics versus handmade such as a study done by Christensen et al. [4] found a significant reduction in navicular drop when wearing CAD-CAM orthotics. In addition, D'Aminco et al. [5] conducted a pilot study to define a protocol for the off-loading performances and statistical comparison of traditional and CAD/CAM designed foot orthoses in the diabetic foot. Their study confirmed that CAD/CAM orthotics achieve better performance than traditional ones. It was unclear whether there are any variations in the effectiveness of orthotics fabricated using the two methods in South Africa. This study aimed to compare the differences in the realignment of functional pes planus between traditional handmade foot orthotics and Computer-Aided fabricated orthotics. A cross-sectional quantitative study, in which fifty patients presenting with a confirmed functional pes planus diagnosis aged between 19 and 59 participated in this study. A pair of Computer- aided design orthotics were manufactured for each participant according to their foot scan and a pair of handmade foot orthotics according to their plaster cast foot model. Severity of pes planus was measured using the Navicular Drop test; thereafter the realignment achieved wearing handmade verses CAD-CAM foot orthotics were quantified. Paired t-Test, Wilcoxon and Friedman tests were used to test differences amongst both types of orthoses. Handmade and CAD-CAM foot orthoses both effectively realigned pes planus foot within the normal navicular drop (N.D) limits, however it was noted that CAD-CAM orthotics achieved greater realignment of pes planus in comparison to handmade orthotics. Moreover, handmade orthotics had failed to realign pes planus in some participants, resulting in an overcorrected foot. CAD-CAM orthotics had accurately realigned pes planus amongst all participants without any discrepancies. The results showed that both types of foot orthoses realign pes planus. It seems that the technology of CAD-CAM orthotics showed greater ability in achieving accurate realignment over handmade orthotics.

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The Somaesthetics of Digital Fashion: Considering the Impact of Deepfake and Animation on the Female Body

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Keywords: aesthetics; AI, biopower, digital fashion, female body; representation

The McKinsey Report of 2022 states, "the metaverse is becoming a big business […] As gaming increasingly becomes an extension of the real world, and with the pandemic supercharging participation, it has become a prime target for fashion brands" [1]. How then do digital models, NFTs and virtual fashion shows used in digital fashion impact on the traditional ideals of female body aesthetics? The impact of the fashion industry on body aesthetics is an area in which much research has been already done [2], but there are, to my knowledge, currently no studies that closely investigate the impact of digital models, NFTs and virtual fashion shows on the body aesthetic of the fashion industry also resulting in societal bodily aesthetic norms. I use Shusterman's somaesthetics [3] and Taylor's sarkaesthetics [4] approach to develop what I assert is a fruitful, philosophical account of the impact of deepfake and animation on the body aesthetics being promulgated in digital fashion by focusing on the female body. To develop my position, I interrogate four examples of deepfake and animation in digital fashion via a somaesthetic and a sarkaesthetic analysis. These examples are Denma Gvasalia's clones of the Balenciaga spring 2022 collection fashion show, Dolce & Gabbana's 2021 Alta Moda Collezione Genesi NFTs, The Diigitals Shudu Gram and Brenn Gram digital supermodels and Anifa Mvuemba's 2020 Hanifa 3D Fashion Show for the Pink Label Congo Collection. My view is that deepfake and animation technologies should be deployed as revolutionary tools for designers, creators and consumers to challenge and change identities. This can happen when involving somaesthetics and sarkaesthetics to probe systemic issues that perpetuate the traditional beauty norms and reduce the embedded biases of designers and creators. This positively impacts the female body aesthetics in digital fashion and extends the body positivity movement. Therefore, the metaverse can also provide a powerful platform to foster the rejection of views and practices that exclude or under-represent non-traditional female bodies in the fashion world.

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Graphical Abstract

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A computational study of mechanistic pathways for the design of a greener process in the production of quinoline-2-(1H)-one and its derivatives

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Keywords: quinoline-2(1H)-one, green, methods, computational, mechanistic, pathway, theoretical, investigation

Quinolinones are heterocyclic aromatic compounds with various pharmacological activities. Their importance brought the need for green synthetic methods [1]. This research focuses on the computational study of synthetic methods for quinolin-2(1H)-one and its derivatives to design a greener method. Mostly used methods such as Skraup method involves non-green substances [2]. Exploring greener pathways using experimental trial and error approach is costly and hazardous hence computational investigations of the existing mechanistic pathways are an alternative. Computational methods prove to be a better way for investigations and design of chemical processes [3]. Calculations are done at Density Functional Theory (DFT) [4] using Gaussian 16 C01 and Gaussview [5].

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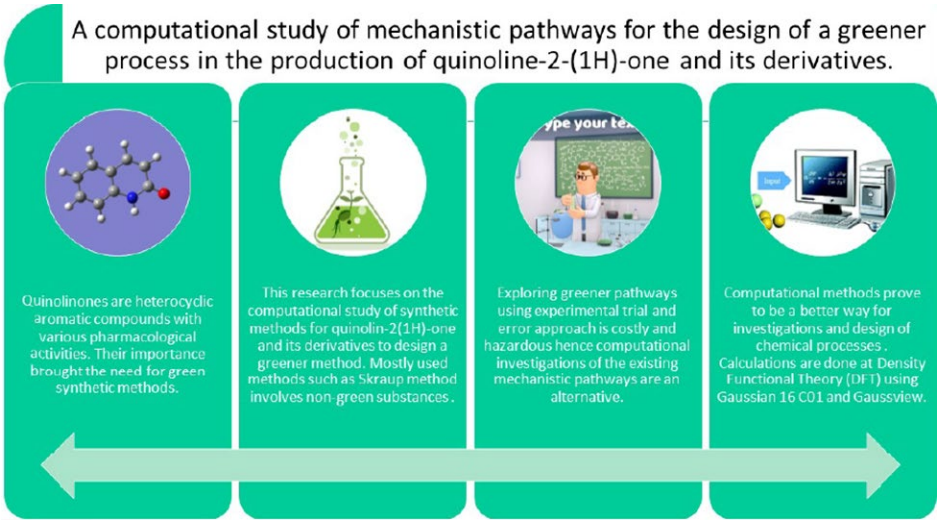
Graphical Abstract



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Learner group dynamics in robotics and coding group projects in Grade 6 Natural Science and Technology

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Keywords: Robotics; coding; collaborative learning; Gr 6 Natural Science and Technology; STEM

Technological advances in the Fourth Industrial Revolution have seen schools start to include robotics and coding in the existing curricula, requiring teachers to reconsider their teaching and learning strategies to accommodate such new technologies. The preferred way of engaging with robotics and coding is through group projects in the form of project-based learning, as equipment is not generally available due to the high cost of robotics kits. Learners thus need to work collaboratively in group projects to share these kits to solve problems jointly. Collaborative learning, as one of these strategies, requires learners to work together, using the resources made available to solve problems jointly. Using unfamiliar technology, such as robotics, in group activities adds complexity to learning in smaller groups. The nature of learner interactions within such projects is characterised by interpersonal dynamics that can influence project outcomes. This study explored Grade 6 Natural Science and Technology learners' interactions in robotics and coding in group projects. The Computer-Supportive Collaborative Learning as a conceptual framework was used to structure the study. Following a qualitative research design, 40 learners from three participating schools in Limpopo and one school in Gauteng province participated in groups of 5 to complete collaborative project-based learning tasks. Each of these sessions was observed and video recorded. Data collection and analysis followed a thematic approach, allowing for the identification of common themes and patterns in teachers' experiences. Atlas.Ti was used to manage data, and generating themes from the coding process was done and completed. Findings indicate that collaboration was typified by high energy, where learners use physical gestures and freely show their emotions when working on projects-based tasks. They were also highly committed to bringing the project to success, where a team leader naturally emerged by controlling the process of experimentation, and attention remained focused on the task. As such, this study underscores the importance of understanding group dynamics when incorporating robotics technology into learners' group projects, thus allowing for the development of collaboration as one of the 21st-century skills.

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Adoption and Impact of 4IR Technologies in South African Firms: A Case Study of the Apparel Manufacturing Industry

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This study provides a case study analysis on the adoption and impact of 4IR technologies in South African apparel manufacturing firms. The apparel sector is labour-intensive sector that is expected to be impacted by advanced technology adoption, however, literature on South African apparel firms adopting 4IR technologies and the subsequent organisational impact is unknown. This research is qualitative in approach and conducted through field work. Apparel manufacturing firms in South Africa were interviewed to answer the research question and meet research objectives. This study is part of a broader project promoted by the DSI/NRF South African Research Chair in Industrial Development and received guidance and inputs from Professor Fiona Tregenna and Dr Alexis Habiyaremye.

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Abstracts

Oral Category

Masters General

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Hidden Threats in the Towers: Unveiling the Presence of Legionella pneumophila in Johannesburg's High-Rise Buildings'

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Keywords: Opportunistic intracellular pathogens; Water distribution system, Legionella

Legionella species are ubiquitous in nature and can spread and settle in the potable water distribution systems of large buildings despite standard treatment procedures. These opportunistic intracellular pathogens rely on amoebae and biofilms as hosts to survive stressful conditions in water treatment systems, thereby reducing the quality of water[1]. The extent of our knowledge of the occurrence of Legionella pneumophila in Johannesburg is limited. This study evaluated the occurrence of Legionella pneumophila and amoeba-associated Legionella according to the IDEXX Legiolert, standard method (ISO 11731:2017)[2], and amoebal enrichment from water and biofilm samples collected from high-rise buildings in Hillbrow (Johannesburg). General physicochemical and microbial water quality were assessed according to standard methods. Quantitative Real-Time PCR (RT-PCR) was performed to confirm the identity of the isolated Legionella species. Walkthrough site assessments were conducted on 15 buildings and 44 apartments (dwellings), and provided information on occupancy, water quality, water distribution, water aerosolization, hot water availability, and usage. The results showed that the general water quality was acceptable according to SANS 241 standards; however, Legionella pneumophila was presumptively detected in three of the buildings by Legiolert. Free-living amoebal trophozoites were isolated from the majority of samples. These amoebas harbored Legionella sp. in three samples, including Pseudomonas sp., Acinetobacter sp., Enterococcus, and E. coli. Legionella pneumophila was confirmed by RT-PCR, and Vitek ® 2 confirmed the identity of the gram-positive and gram-negative bacterial pathogens. The presence of these opportunistic pathogens, as well as free-living amoebas in building water systems, can lead to a potential health risk in immune-compromised individuals. This study was important for identifying the possible risks of Legionella and promoting awareness and education about Legionella prevention and control.

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Name: Kutloano
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Cleaning up the Jukskei River- City, Civil Society and Community in Lorentzville, Johannesburg

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Keywords: Waste management, waste service delivery, community, state, civil society organisations

The City of Johannesburg Metropolitan Municipality Waste Management By-Laws lay emphasis on the significance of waste management through protecting our broader surroundings and establishing sustainable ways to combat the waste issue within the economy [1]. Amongst the socioeconomic difficulties experienced in Lorentzville, Johannesburg, prevalent waste issues such as illegal waste dumping by community members which becomes problematic and expensive to maintain by state [2], damaged water infrastructure due to the city's water systems being old and worn out [3], alien invasive plants that are fire hazardous and weaken surrounding soil [4], and inadequate waste service delivery negatively impacted the Jukskei River; making the interrelationship between state, community and CSOs crucial

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Exploring the causes of dyscalculia in foundation phase: a case study of a primary school in Pretoria

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Keywords: Dyscalculia, diagnosis, Visuospatial working, Neurodivergent, genetics

The acquisition of mathematics knowledge is seen as a complex and hard mental task, some children experience severe struggle with the process of acquiring arithmetic information [1]. The study aimed to identify the underlying causes of dyscalculia among children at the Foundation Phase in South Africa. There are two elementary parts of dyscalculia that are commonly recognized: the struggle to obtain and remember mathematics knowledge, and the struggle to accomplish mathematical methods. This study searches for dyscalculia's basic causes in South Africa. Literature indicates that there are several causes of dyscalculia, including genetic factors, cognitive deficits, math skill deficits, and brain differences [1]. The study adopted a qualitative approach and data was collected through classroom observations and interview. Learners were interviewed using focused group interviews approach while teachers and educational psychologists were interviewed individually. Virtual meetings were also conducted with doctors and educational psychologists to explore from their perspective the causes of dyscalculia amongst foundation phase learners in Pretoria schools. The data collected from the population delineated that some of the causes of dyscalculia could be the neurodivergent of learners that limits the acquisition of arithmetic information, poor visuospatial working memory, lack of concentration, the learning environment, lack of prior knowledge and lack of early identification of dyscalculia and mathematics anxiety among learners. The study is significant at the time as it raised awareness, knowledge, and understanding of dyscalculia among professionals since it has been prevalent for so long. This study is necessary because awareness of dyscalculia will result in resolutions that could mitigate some of the causes stated above. Further research related to the disorder, early the diagnosis of the disorder as well as intervention strategies need to be considered.

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The effect of performance-based remuneration on the performance of government employees: A case of the Department of Home Affairs

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Keywords: employees, performance-based remuneration, public sector, government

Employees are the backbones of all organizations and the most important assets that help to achieve the goals and objectives of an organization or institution (Calvin 2017:34)[1]. Government departments and public institutions depend on the performance of government employees as means to respond efficiently and effectively to the needs of the citizens (Heathfield 2021)[2]. The Department of Home Affairs (DHA) was established with a core mandate to "register and affirm the identity and status of citizens and to regulate immigration efficiently and securely" (Department of Home Affairs 2022:5)[3]. This study analyses performance-based remuneration and the impact it has on government employees' performance at the Department of Home Affairs. It uses the experiences of different countries around the world to demonstrate the successes and shortcomings of performance-based remuneration in the public sector in respect of government employees' performance. Moreover, the study aims to investigate the effects of performance-based remuneration on the performance of government employees. The implementation of performancebased pay systems has been a subject of interest and debate in the public sector for its potential to enhance employee motivation, productivity, and overall organizational effectiveness. Through a comprehensive analysis of existing literature and data collection, this study seeks to provide insights into the relationship between performance-based remuneration and the performance outcomes of government employees. The study adopts qualitative research method. The qualitative component involves an extensive literature review of academic journals, research papers, government reports, and policy documents related to performance-based remuneration in the public sector. By highlighting the importance of meticulous design, transparent communication, and proactive conflict resolution strategies, this study extends a roadmap for DHA to navigate the path toward effective implementation. The recognition that minors obstacles are a natural facet of any transformative process serves not to dampen the prospects, but rather to fortify the commitment required for successful execution.

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Environmental motivations for the adoption of plant-based diets: A study of the City of Johannesburg

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Keywords: plant-based diets, veganism, sustainable diets, pro-environmental behaviour, climate change, Sustainable Development Goals, Johannesburg

This study explores the environmental motivations for the adoption of plant-based diets (vegan, vegetarian, and general plant-based) by City of Johannesburg consumers. The IPCC mitigation of climate change report shares that a balanced diet founded on plant-based foods including grains, legumes, fruits, vegetables, nuts, and seeds in lowered GHG emission food systems provide vital climate change adaptation and mitigation opportunities [1]. This also provides co-benefits of improving human health, animal welfare, and supporting the Sustainable Development Goals [2]. Plant-based diets have grown both internationally and in the South African context with local food businesses offering plant-based meat, fish, and dairy alternatives [3]. This research was based on a positivist paradigm and made use of a merged methodology approach to collect qualitative and quantitative data via an online questionnaire that included 307 participants from Johannesburg, South Africa. A non-random sampling technique was used to select respondents which was supported by further snowball sampling. Data analysis included descriptive statistics, correlation, and content analysis. The findings of this research depict that environmental concerns including resource usage, Greenhouse Gas emissions, and climate change are a motivating factor for the local adoption of plant-based diets. The participants also shared their attitude towards Dunlap's New Ecological Paradigm Scale [4] and the practice of other pro-environmental behaviours. It was found that CoJ plant-based residents ranks NEP scale factors of rights and laws of nature, and the balance between humans, animals, and nature highly while other behaviours of recycling, travel, and responsible purchasing was practiced more than foraging, and growing fruits and vegetables.

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Diabetic foot complications and their management at primary health clinics in Johannesburg

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Keywords: Diabetic Foot, Primary healthcare, podiatrists, diabetic foot complications, neuropathy

Primary healthcare (PHC) in South Africa is predominantly nurse-driven, focusing on illness prevention and treatment of acute and chronic disorders [1]. However, data on diabetic foot complications at PHC clinics is limited, and the role of podiatrists in prevention is underutilized [2]. Diabetic foot complications, particularly ulcers, are a significant cause of amputations, with early identification and treatment crucial for prevention [3]. This cross-sectional retrospective study involved 536 diabetic patients with foot complications from three Johannesburg PHC centers [4]. Descriptive statistics were used to analyze patient data. The study reveals a high prevalence of diabetic foot complications in primary care clinics, emphasizing the need for community foot health promotion and podiatrist involvement. Early intervention is crucial, especially in patients with longer diabetes duration [5]. Inadequate management and screening of foot-related complaints by nurses are observed. Lack of guidelines and well-defined referral pathways contribute to inadequate diabetic foot management [6]. The study concludes that podiatrists should be integral to PHC teams to improve diabetic foot care.

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The Representation of Childless Women in Polygamous Marriages in the Reality Television Show Uthando Nesthembu

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Keywords: Polygamy, Polygyny, Stigma, Representation, Media Representation, Childlessness/Infertile, Stigma, Reality Television Show

This study investigates the representation of childless women, particularly in Zulu traditional polygamous marriages, to establish the depth of stigmatisation of childless women as depicted by the media. My study aims to describe the consequences of the stigmatisation of childless women in traditional Zulu culture. It also aims to identify the ways in which the reality television show Uthando Nesthembu contributes to the de-stigmatisation of childless women in South Africa. Women at the margins of society, such as MaKhumalo the third wife, need to be represented in the media because such representations may allow society to view childlessness in a less negative way. This study will argue that the media may contribute to a change in societal perceptions of childless women. The contribution of this study relates to the scarcity of research conducted on the media representation of childless Black women in polygamous relationships in South Africa. The study utilises the Stuart Hall's Representation theory [1] and Stigma theory by Erving Goffman [2], which provides insight on how media depictions can influence people's views on childless women. The research employs the qualitative research orientation. Thematic Analysis [3] will be used to generate the themes that will be found for this research. The study will use a case study design, particularly focusing on MaKhumalo as a 'case profile'. The non-probability purposive sampling method will be used to select the episodes of the show that discuss childlessness. An intrinsic case study data collection approach will be used to gather data from all six seasons of Uthando Nesthembu. The research does not have results yet as it is an ongoing study.

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The thin line between rescue and drowning: A comparison between South Africa and Malawi Business Rescue Law

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Keywords: Business Rescue

'Rescue culture' has swept through global commercial circles, and now has a firm grip on the insolvency legal frameworks of African countries. Rescue culture refers to the principle that "where possible a bankruptcy or liquidation should be avoided despite that the debtor is or is nearly insolvent" [1] Business rescue is highly relevant as it is currently a driver for global post-pandemic recovery. Effective legal rescue frameworks are central to the success rate of the rescue of distressed businesses. Malawi can be said to be one of the least developed countries in Africa, while South Africa has one of the strongest economies in Africa [2] Malawi's insolvency laws have received an overhaul, while South Africa has long standing insolvency frameworks which have been partially renewed by corporate law legislation. In light of the above, a comparison of the South African and Malawian legal frameworks is fitting. The purpose of this study is to examine rescue frameworks of South Africa and Malawi and determine whether they are fit for purpose, having regard to their respective economic statuses. The study will be of a comparative nature and limited to certain aspects of the rescue regimes of each country, while considering the possibility of law reform. It will be argued that the success of business rescue frameworks are based on foundational pillars of the three P's, namely (i) the practitioner, (ii) the process and (iii) the participation. In this regard I will submit that in order for rescue to be successful, a framework will need to provide for a qualified and accountable practitioner with appropriate powers, an efficient and low cost process of rescue which addresses the objectives and effective participation by stakeholders. The legal framework of each country will be measured against these standards. It has been concluded that both legal frameworks have adequate provisions necessary to implement rescue, but that both, and particularly Malawi, could benefit from amendment to improve effectiveness and allow for accessibility. The recommendations for reform include Malawi implementing non-court initiation and regulation of rescue proceedings to encourage accessibility, and making provision for participation of stakeholders as they play a pivotal role in the rescue. Recommendations for South Africa include wider powers for the practitioner as well as an emphasis of training in insolvency; making rescue available to other business forms; enabling the Companies Tribunal to play a role in adjudication of rescue proceedings and engaging in pre-consultation with stakeholders to reduce the risks of litigation. Both countries are burdened with poverty and unemployment, as such an effective rescue framework is necessary to ensure the social and economic wellbeing of the inhabitants of both countries and ultimately securing rescue over drowning.

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Carbon nanotube-infused nanocomposite membrane for treatment of oily saline wastewater containing per-and polyfluoroalkyl substances (PFAS)

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Keywords: water treatment, membranes, carbon nanotubes, wastewater, artificial neural networks

Wastewater discharge into the environment has propelled decline in fresh water sources. This has stimulated interest in novel technologies that remove contaminants in water before it can be discharged into the environment. Development of hollow fiber modules have gained considerable attention over flat sheet modules due to their staggering performance on rejection of contaminants in water. The principal aim of this study is to investigate performance of hollow fiber nanocomposite membranes infused with carbon nanotubes (CNTs) on a pilot scale process to reject oil emulsions, salts, and poly-and perfluoroalkyl substances (PFASs). Response Surface Methodology-Central Composite Design (RSM-CCD) model would be used to predict and optimize performance of the module. Scanning Electron Microscopy (SEM), Transmission Electron Microscopy (TEM), Fourier Transform Infrared Spectroscopy (FTIR) and Raman spectroscopy will be used to study morphology and chemistry of CNT-infused nanocomposite membranes. It is anticipated that the fabricated membranes would be able to efficiently remove contaminants (salts, oils and PFASs) from water with high rejection. Infusion of CNTs would improve mechanical and antifouling properties of membranes resulting in improved water flux. Other studies that focused on the use of CNTs-infused membranes reported good performance of membranes in terms of permeate flux, rejection of pollutants and antifouling properties [1][2]. Developed model will improve performance of nanocomposite membrane module by predicting performance of module then manipulate process parameters to optimize the treatment process. To reduce fouling of membrane, module will periodically backwash the membrane depending on the frequency of pollutants forming a layer on membrane surface. Proper research and development of nanocomposite membranes is alternative for cheap industrial wastewater treatment and removal of PFASs.

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Bacillus paranthracis strain MHSD3 Exopolysaccharide: Production, Characterization and Bioactivities

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Keywords: Bacillus paranthracis, Exopolysaccharide, Characterization, Bioactivities, Bacterial Endophyte

Bacillus species have garnered the global spotlight due to their potential probiotic abilities and capabilities to withstand extremely harsh conditions. The species remarkable ability to survive in different environments is centered around the ability to produce essential metabolic compounds, such as exopolysaccharides (EPSs), and enzymes [1]. Research efforts into Bacillus derived EPSs have placed the metabolic compound on the list of essential bioactive natural materials for medical application [2]. The study focused on the EPSs synthesized by Bacillus paranthracis strain MHSD3 wherein the improvement of EPS production was executed by means of enhancing several culture media. The weighing and testing of EPS concentration by phenol-sulfuric assay indicated that enhanced tryptic soy broth media was the optimum environment for EPS cultivation with an average EPS production of 54.3 mg and concentration of 7 µg/mL. The characterization of the EPS by means of Fourier Transform Infrared analysis confirmed the presence of carboxyl groups, sulphate compounds and hydrogen bonded compounds. HPLC analysis identified the presence of glucose, mannose, and fructose within the extracellular compound. Furthermore, by means of Nuclear Magnetic Resonance analysis 1,6 linked – α – D – Glcp, 1,4 linked – β – D – Glcp and 1,4 linked – α – L – Fucp residues were confirmed. The e EPSs illustrated appreciable biological capabilities with notable in vitro antiinflammatory activity by means of albumin denaturation inhibition, a stable membrane stabilisation test and noteworthy antitumor activity by inhibiting the proliferation of HepG – 2 and HT – 29 tumor cells. Overall, the study reported the first steps into the complex structure and bioactivities of recently isolated Bacillus paranthracis strain MHSD3 EPS as an up-and-coming natural bioactive raw compound for medical application.

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Abstracts

Poster Category

PhD

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Comparative studies of Cu-doped CoCr2O4 nanoparticles obtained by green and chemical synthesis method towards the cancer applications

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Keywords: Sol-gel method, green synthesis, Cu-doped CoCr2O4, Krantz aloe (Aloe arborescence), XRD, TEM, cancer, HEK-293, DLD-1, Nanoparticles

Nanotechnology can be defined as the science and engineering involved in the design, synthesis, characterization, and application of materials and devices by manipulating atoms and molecules at the nanoscale. Nanotechnology plays a major role in the applications of biological labels in fluorescent materials, drug-gene delivery, tissue engineering, detection of pathogens, proteins, and tumors, separation, purification of biological molecules and cells, MRI contrast enhancement, and phagokinetic studies [1]. Cr is a transition metal that helps in metabolizing glucose in the human body, while Co is involved in the production of red blood cells [2]. Cu is essential for the development of the brain, nerve cells, connective tissue, wound healing, maintenance of healthy skin, function of heart and blood vessels, proper structure and function of circulating blood cells with effective immune response [3-7]. Combining these essential elements in a single compound, the present work considers Co(1−x)CuxCr2O4 nanoparticles, with x = 0.10, 0.50, and 0.90, synthesized by sol-gel and green synthesis methods and calcined at 800 °C. In the green synthesis method, the ethanol plant extract from Krantz aloe (Aloe arborescence) was used. The powder x-ray diffraction patterns confirmed that the compounds are pure and crystallized in a cubic structure for all the compositions. The average particle size and morphology of the nanoparticles were determined using transmission electron microscopy. The Co(1−x)CuxCr2O4 nanoparticles, obtained by green and chemical synthesis methods, were evaluated for their anticancer potential in terms of cell viability against normal (human embryonic kidney 293; HEK-293) and cancerous (colorectal adenocarcinoma cell; DLD-1) cells. Results indicate that the nanoparticles obtained through the green synthesis method showed less toxicity against HEK-293 cells when compared to nanoparticles obtained by the chemical synthesis method. The effect of the plant extract used in the preparation of nanoparticles and the resulting impact on HEK-293 and DLD-1 cells will be discussed in detail.

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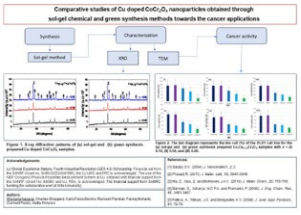
Graphical Abstract



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The effects of a highly polluted freshwater system on the liver structure and function of the African sharptooth catfish

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Keywords: Clarias gariepinus, Liver, Hepatotoxin, Active biomonitoring, Roodeplaat Dam

The African sharptooth catfish (Clarias gariepinus) is a food source rich in omega 3 fatty acids that has been used as a bio-indicator species in numerous water pollution studies throughout Africa [1,2]. Clarias gariepinus inhabits the highly polluted Roodeplaat Dam, the current study site. Numerous studies have reported heightened concern regarding the ecological condition of the Roodeplaat Dam due to its highly polluted status [1,4]. Nutrient enrichment of an aquatic ecosystem can result from pollution, including sewage discharges that enrich aquatic ecosystems with nitrogen and phosphorus, therefore resulting in blooms of cyanobacteria which can produce bio-toxins like microcystins [3]. A highly polluted freshwater ecosystem has high concentrations of microcystins, which are hepatotoxins that are reported to adversely affect liver structure and function. They bioaccumulate in fish tissues and have been shown to cause oxidative stress [2,3]. Previous studies have shown bioaccumulation of microcystin-LR in Clarias gariepinus from Roodeplaat Dam, and severe liver pathology in this species within the same system [1,3]. However, it is still unknown whether acutely exposing laboratory-bred C. gariepinus to dam water using active biomonitoring will impair the liver structure and function of this fish. Therefore, the current study aimed to compare the liver structure and function of twenty-five unexposed, translocated African catfish acutely exposed to dam water, with those of fish inhabiting the dam, as well as a laboratory reference group using liver ultrastructural (TEM), enzyme biomarkers and histological analyses (LM). For the liver functional aspect of the study, a statistically significant decline in the activity of three liver enzymes (aspartate transaminase, alanine transaminase, and alkaline phosphatase) was observed in the translocated fish, and the percentage (%) prevalence of melanomacrophage centers, hepatocellular pleomorphism, intracellular deposits, and steatosis was higher in the translocated fish than in the reference group for the histological analysis. Furthermore, vesiculation and dilation of the rough endoplasmic reticulum (RER), an increase in myelin bodies and pleomorphic nuclei were observed in both the translocated fish and those inhabiting this highly polluted system when compared to the reference group. These results suggest an adverse acute liver response, in terms of enzyme functionality and microscopic structure, in fish exposed to the dam water.

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The role of developmental local government in the Fourth Industrial Revolution

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Keywords: Government, local government, development, developmental local government, and fourth industrial revolution

There is a growing trend of development problems such as poverty, unemployment, lack of housing, illiteracy, crime, corruption, diseases, protests, lack of service delivery, and slow response rates to citizens' requests, which are enormous (Wissink 2006:7) if the capability of municipalities to take advantage of the opportunities offered by the 4IR is not recognized. The primary objective of this study was to assess the role of developmental local government in the 4IR and to make proposals for improving local government to fully benefit from the 4IR. The researcher has used a mixed-methods research approach. Quantitative data were collected through structured questionnaires from 200 respondents using International Business Machinery (IBM): Statistical Product and Service Solution (SPSS) version 25.0. Qualitative data collected through unstructured interview schedules from twenty (20) respondents were analysed using Atlas ti version 23.1.2.0 software. This study found that sufficient financial resources need to be invested in order to achieve notable results of the 4IR at a desired level. The role played by developmental local government in the 4IR is a salient one, though they continue to face challenges in fostering innovation. Challenges highlighted include financial constraints, fear of the unknown, and resistance to change, red tape, and lack of awareness. This study was able to highlight the challenges encountered in implementing the 4IR in developmental local government. People who cannot receive traditional help would receive support from the 4IR. Mopani District Municipality's development projects implemented by municipal officials are one of the ways to accelerate the implementation of the 4IR. This study discussed the cyberattack problems that could be exacerbated by the 4IR. Therefore, it is necessary to ensure that security levels in this 4IR are a priority.

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Graphical Abstract

Figure 1: Flow diagram of the methodology executed in exploring the role of developmental local government in the Fourth Industrial Revolution

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Development of novel food ingredients from a composite of finger millet, edible cricket, and spekboom leaves

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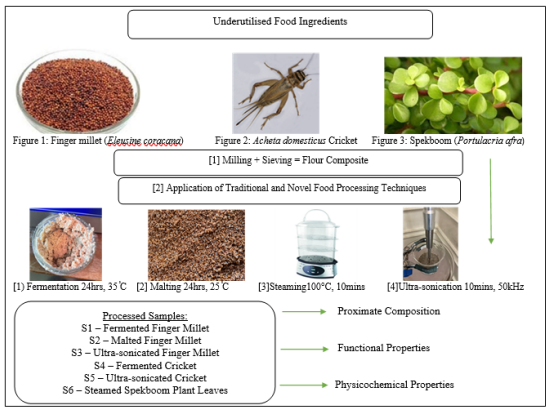
Keywords: Food Processing, Food Security, Human Nutrition, Underutilised Foods

Underutilised crops and edible insects have the potential to improve food insecurity, elevate human nutrition and grow the agricultural food basket. This study examined the effect of traditional food processing techniques (fermentation, malting, and steaming) and a novel food processing technique (ultra-sonication) on selected quality characteristics of finger millet, edible crickets, and spekboom plant leaves. Finger millet were respectively fermented and malted at 35°C for 24 h, while edible crickets were fermented for 24 h at 35°C. Spekboom plant leaves were on the other hand steamed for 4 mins at 100°C. Finger millet and edible cricket were ultra-sonicated at 50 kHz for 10 mins. Proximate composition, techno-functional properties, and physicochemical properties of resulting freeze-dried flours were determined. In general, protein content for fermented finger millet (8.12%) was higher compared to malting (7.90 %) and novel (7.84 %) processing. For edible cricket, the protein content for novel processing (77.0%) was considerably higher than traditional fermentation processing, in contrast, the steam processing for plant leaves exhibited a protein content of (11.89%). Fibre content for novel processing in finger millet (7.83 %) was higher compared to malting and fermentation processed samples. Evidently, for edible cricket novel processing (11.49 %) was higher compared to fermentation processing (9.1%). In addition, the fibre content for traditional steaming in plant leaves was (14.07 %). In terms of functionality, steamed plant leaves and ultra-sonicated finger millet and edible cricket resulted in a significantly higher swelling power than malted samples. Processing (both traditional and novel) resulted in a lower pH (4.48 to 6.19) when compared to the raw samples, while total titratable acidity was higher in fermented samples compared to the steamed, malted and raw samples. A similar trend was also observed for the total soluble solids which were higher in the malted and fermented samples, compared to the other samples. The results indicate that both traditional and novel processing techniques could improve the composition of the food sources investigated. The respective improvements in the processed samples could give supreme complementary processing and quality attributes for flour combination composite to develop a product high in protein, improved nutritional content, and satisfactory functional properties.

Graphical Abstract



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Leaching properties of Duvha fly ash

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Keywords: Fly ash, heavy metals, leachate, waste management, sustainability

Fly ash is abundantly available in South Africa and is usually disposed of in landfills. However, landfilled industrial waste materials interact with the environment leading to groundwater, air, and soil pollution. This study aims to determine and quantify the heavy metal concentrations in fly ash from the Duvha power station and compare the results with the United States Environmental Protection Agency (US EPA) regulatory limits. The toxicity characteristic leaching procedure (TCLP) and inductively coupled plasma-mass spectrometry (ICP-MS) methods were used for leachate measurements. The results showed that the fly ash can be considered non-hazardous since the amounts of heavy metals and/or toxic elements such as Hg, Pb, Cu, Cd, Zn, Ni, As, P, Co, Se, and Mn are below the US EPA limits. The study findings can help industrial players and policymakers manage fly ash disposal and/or management thereby reducing the environmental impact and promoting its circularity in the built environment. However, prolonged landfilling of FA has the potential to release dust and small amounts of leachates into the environment and thus calls for continuous monitoring or recycling.

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Supervisor(s): Professor Abayneh A. Ambushe

Adsorption of Potentially Toxic Elements from Aqueous Solutions Using Organically Modified Bentonite and Kaolin Clays

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Keywords: Adsorption, Bentonite, Kaolin, potentially toxic elements

This study focused on addressing water treatment challenges in South Africa by developing costeffective organoclays capable of removing potentially toxic elements (PTEs) from water and wastewater. Organoclays are synthesized by introducing organic molecules into clay structures, and previous research has proven their effectiveness in removing various organic contaminants [1]. However, their potential to remove inorganic contaminants like PTEs has not been fully explored. The aim of this study was to investigate the ability of bentonite and kaolin clays, modified with hexadecyl trimethyl ammonium bromide (HDTMA), to remove PTEs, particularly Pb(II), from water. The clays were thoroughly characterized using various analytical techniques. The study also examined several factors influencing Pb(II) removal, including solution temperature, contact time, adsorbent dosage, solution pH, and initial Pb(II) concentration. Key findings of the study included successful incorporation of HDTMA into the clay structures, leading to an improvement in Pb(II) removal efficiency for bentonite from 73% to 84%. Optimal conditions for Pb(II) adsorption were identified. The optimum pH was found to be at 6, an adsorbent dosage of 200 mg, and a temperature of 25°C. Additionally, equilibrium data were fitted to various isotherm models, with the Freundlich isotherm model showing a good fit. Thermodynamic parameters revealed ΔH° and ΔS° values within the range of 1 to 93 kJ/mol, indicating that the adsorption process was favourable, and the negative ΔG° values suggested spontaneous adsorption [2]. These findings suggest that bentonite and organobentonite can be used as effective adsorbents for Pb(II) removal and have the added advantage of being low-cost materials.

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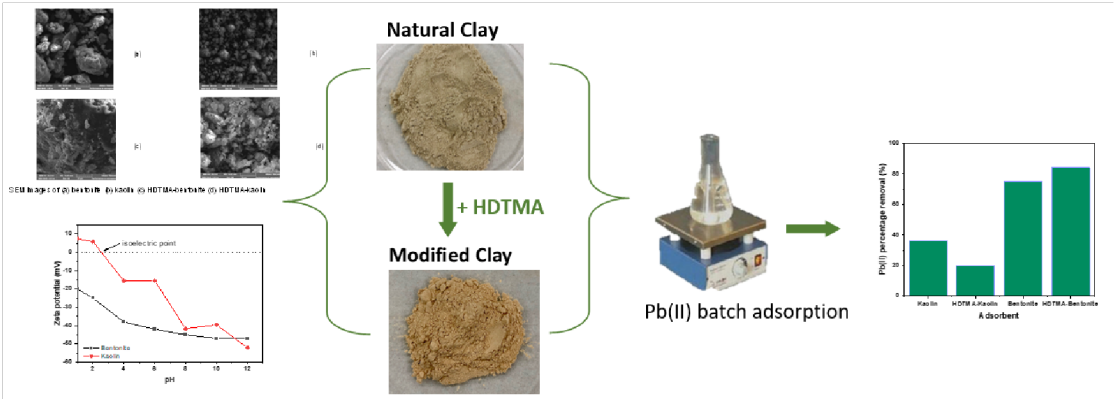
Graphical Abstract



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A Techno-economic Analysis on the Co-production of Hydrogen and Carbon Nanotubes (CNT) from the Gasification Process of Waste Tyres and Waste Biomass

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Keywords: Waste Tyre; Biomass; Hydrogen; Carbon Nanotube; Techno-Economic Analysis

Waste gasification as an alternative renewable energy source has been regarded as a viable thermochemical conversion process to pyrolysis and combustion [1]. Gasification technology involves the process by which air, oxygen, CO_2, and/or steam reacts with solid fuels (tyres, plastics, biomass, etc.) to produce gaseous product such as Syngas and Hydrogen and by-products such as CO_2, char and hydrocarbons (HC)[1]. Previous studies by researchers have shown that solid carbon by-products from gasification and co-gasification processes have not been put into viable use, hence, there is the need to investigate this research areas [2]. The key objective of this study is to perform a techno-economic analysis that will ascertain both the technological feasibility of the production process as well as the economic viability. In the proposed production route, five major processes were identified. They include Gasification followed by Syngas cleaning to purify the syngas stream by removing toxic gases (COS, H_2S and CO_2); Water-gas shift to improve Hydrogen conversion; Membrane separation to separate Hydrogen from the process and Chemical vapour deposition (CVD) to synthesize the CNT from the HC components. To maximize production, a detailed sensitivity analysis was investigated to check the effect of feed ratio, temperature, and gasifying agent. The results shows that feedstocks with high carbon have the tendency to produce more CNT. The best combination of tyre-to-biomass were found to be 75:25. In addition, high steam and moderate oxygen improves feed conversion. At the best condition, 1kg of waste feed can produce ~0.17kg of Hydrogen and ~33kg of CNT. From the process economic, the capital-intensive processes were found to be the syngas cleaning and the CVD. These two processes can slow down production in a pilot scale process, however, on industrial scale, the co-production process have a good ROI (>50%) and NPV (>$500M). In addition, the minimum selling price (MSP) of the Hydrogen produced from the process was $2.5/kg which also ascertain the economic viability of gasification production route when compared to other Hydrogen production technologies. The sensitivity analysis from the economics was also performed to ascertain that any slight variation in economic parameters will not have significant effect that could hinder continuous production over the next 20 years. The result from the analysis shows that the MSP of both Hydrogen and CNT, the Operating Expenditure (OPEX), Loan interest rate and Inflation Rate have the most effect on the economic feasibility of the process.

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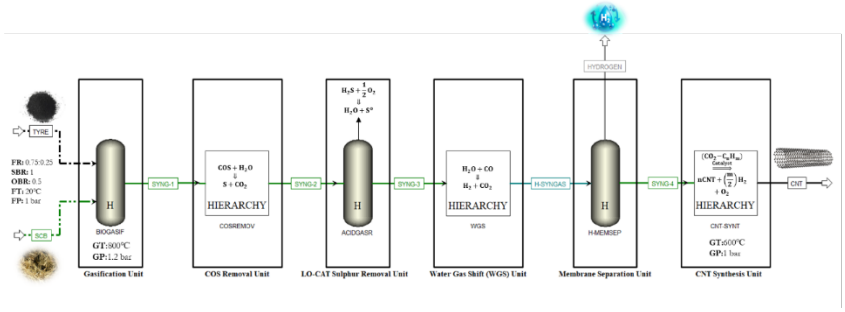
Graphical Abstract



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The management of sexually transmitted infections in healthcare facilities among key and priority populations in Sub-Saharan Africa: a systematic review

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Keywords: sexually transmitted diseases, key and priority population, healthcare facilities, Sub-Saharan Africa

The prevalence of Sexually Transmitted Infections (STIs) continues to grow at an unparalleled rate among key and priority populations [1]. Sub-Saharan African (SSA) countries was indicated to have insufficient management and care for STI patients, especially among key and priority populations [2; 3]. The aim of the study was to describe factors that contribute to the rise in STIs as well as gaps and challenges in primary healthcare facilities among key and priority populations in SSA. A review of grey and published literature from 2014-2023 was conducted on STI management and diagnostic testing in healthcare facilities among key and priority populations in SSA. PubMed, Google Scholar, ScienceDirect, Scopus, and Medline were selected as databases for this study. Article screening and a PRISMA diagram were conducted using the Covidence software. Populations, Intervention, Control, and Outcomes were used for exclusion and assessment criteria. Only 50 studies (experimental, quasi-experimental, observational) were included in this study. Preliminary results: Between 2014-2023, STI management or service delivery modes have not changed, and it does not cater to all the needs and preferences of key and priority populations. Almost all the Sub-Saharan African countries still rely heavily on the syndromic approach because of limited recourses which tend to undertreat asymptomatic STIs and result in adverse health outcomes. Diagnostic STI testing is also rarely done in most healthcare facilities due to being expensive.

Conclusions: These findings provide an opportunity to improve and strengthen the current STI management through services integration and improvement of linkage to services among key and priority populations. Therefore, is a need to scale up efforts and expand approaches that will improve STI screening and monitoring to improve and strengthen STI response among key and priority populations.

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Greener neighbourhoods show resilience against the spread but not severity of COVID-19 in South Africa

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Keywords: COVID-19, greenery, enhanced vegetation index, forest, grassland

The outbreak of COVID-19 quickly spread around the globe with staggering infection and mortality rates [1]. Given the reported benefits of greenness to human health [2], we hypothesized that greener neighbourhoods would suffer less COVID-19 infection and severity than not [3]. We modelled COVID-19 infection and severity in South Africa by fitting Generalized Linear Mixed Effects models to various socio-demographic and greenness variables (i.e., Enhanced Vegetation Index [EVI], forest and grassland covers) collected from January 2020 to June 2022 at Local Municipality, Wards, and Districts scales. EVI and forest cover consistently show a significant negative correlation with the COVID-19 infection rate, irrespective of the scale of analysis. Also, grassland cover shows a significant negative correlation with infection rate, but only at the Ward scale. Finally, we found that neither EVI, grassland cover, nor forest cover has a significant association with COVID-19 severity. Greener neighbourhoods show greater resilience to the spread of COVID-19, suggesting that greenness may be buffering the spread of COVID-19 infection [4]. One of many potential explanations is that exposure to greenness may boost natural killer cells in the human body, thus reinvigorating our defence system against infection [5]. This provides an opportunity for the preservation of greenspaces, not only for their ecological functions but for the services they provide to human health conditions. We postulate that a continued provision of evidence of the positive effects of greenspaces on human health would eventually convince decision-makers to pay the needed attention to greenspaces in urban planning.

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Transfer learning based on ResNet50 and VGG16 for fault identification in the wind turbine high-speed shaft bearing with limited samples

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Keywords: Convolutional neural network; fault identification; highspeed shaft bearing; transfer learning; wind turbine gearbox

Wind power offers a promising solution to the global energy crisis; besides, it is clean and renewable. However, the frequent failure of the high-speed shaft bearing (HSSB) in the wind turbine gearbox has hampered its economic viability [1]. Due to the challenges of conventional fault identification models, signal analysts have increasingly used deep learning models to identify faults in the HSSB. Deep learning models, however, require abundant labelled training data. Such data is often scarce, especially in the faulty category. While data augmentation through generative models helps, biases from the original data persist, and larger datasets strain computational resources [2]. As a solution, experts are turning to transfer learning. Leveraging insights from related domains, transfer learning enables machine learning models circumvent the exigency of training from scratch with extensive data [3]. This study proposed a transfer learning strategy for fault identification in the wind turbine high-speed shaft bearing. Two-dimensional matrices extracted from vibration signals sampled from the HSSB are employed to train ResNet50 and VGG16 convolutional neural network models with frozen weights based on transfer learning. While both models performed well on the normal test samples, the VGG16 outperformed the ResNet50 when evaluated with noise-induced test samples, albeit with a trade in computation time. The ResNet50 had an accuracy, F-score, and training time of 82.21%, 78.34%, and 26.3 sec, respectively, while the VGG16 model had an accuracy and F-score of 95.55% and 95.35%, respectively, but trained for 46 sec. Both models outperformed a vanilla CNN model in a related study [4] that was trained from scratch with extensive data. While the VGG16 is computationally intensive, its superior performance and resilience to noise make it a potential resource for data analysts seeking efficient fault diagnosis with limited samples in the wind turbine space.

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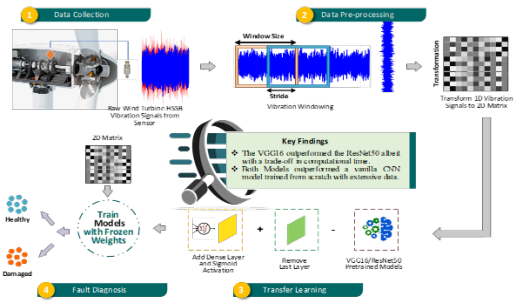
Graphical Abstract



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Evidence-Based Interventions for the Uptake of HIV Treatment Services Among Key Populations During Covid-19 Lockdown in Sub-Saharan Africa: A Systematic Review

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Keywords: HIV, COVID-19, Key populations, Antiretroviral treatment, Evidence-based Interventions, Sub Saharan Africa

The coronavirus disease 2019 (COVID-19) has had a significant impact on HIV treatment services among key populations (KPs) [1]. Little is known about the interventions implemented to mitigate the impacts of COVID-19 on HIV treatment services among KPs in Sub-Saharan Africa (SSA). The aim of this systematic review is to assess changes and evidence-based interventions implemented towards strengthening the uptake of HIV treatment services among KPs during the COVID-19 lockdown in SSA. This review was carried out using the Preferred Reporting Items for Systematic Reviews and Meta-Analysis guidelines (PRISMA) and registred with the International Prospective Register of Systematic Reviews (PROSPERO) (CRD42022341813) [2]. A comprehensive search of literature was conducted and 17 eligible articles published between 2020-2022 were included. The KPs reported in this systematic review include: female sex workers (FSW) and their clients, male sex workers (MSW), transgender persons (TG), people who inject drugs (PWID), prisoners and other incarcerated people as well as gay and other men who have sex with men (MSM). The review showed that of the ten studies for HIV treatment/care service delivery among the general population in SSA during COVID-19 lockdown; five had interventions and the other five did not have interventions to mitigate the impacts of COVID-19. Regarding KPs, there were limited KP specific interventions (three) implemented to mitigate the impact of COVID-19 on HIV treatment services. This is attributed to the fact that KPs are generally not prioritized in the HIV response despite having higher risk of HIV acquisition and transmission. Differentiated service delivery interventions were implemented among KPs across physical and virtual locations such as drop-in centres; websites; and in communities. These interventions demonstrated improvements in HIV treatment linkage, initiation, and viral suppression. More evidence-based interventions are needed to minimize the disruption of the provision and utilization of HIV treatment uptake and delivery among KPs during pandemic times as they tend to be side-lined, stigmatised, discriminated against, criminalized, violated and denied access to essential health care services [3]. Such interventions may include the establishment of KP specific health centres and having these considered as part of essential healthcare services to enable continuity of services throughout. There is also a need for increased and ongoing sensitivity training for health care workers in public health facilities to alleviate stigma and discrimination. Further, the legal support systems to protect KPs right to health care and policies to minimize discriminatory language/behaviour towards KPs by health care workers and the public (including strict sanctions) should be in place. Mental health and social supports may also be provided to improve health and wellbeing of KPs.

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The Development of Anion Exchange Ionomer for Electrocatalysts in Application of Anion Exchange Membrane Fuel Cells

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Keywords: Alkaline Alcohol Fuel Cells, Anion Exchange Ionomer, Electrode binder, Fuel cells

Anion exchange membrane fuel cells (AEMFCs) are known to be able to address the use of expensive platinum catalysts by employing non-PGM (Platinum Group Metal) metal catalysts, affordable ionomers, and greater fuel flexibility [1]. All of that provides AEMFCs with advantages over PEMFCs. However, AEMFCs have not been reported to achieve high current density as desired at fault by the lack of understanding of ionomer-catalyst interaction. For stable operation of AEM-based devices, water sorption, and swelling of the thin anion exchange ionomer (AEI) layer are coupled to its catalyst binding ability. Unfortunately for the AEM fuel cell field, there exists no commercial material as Nafion® exists for the PEM fuel cell field. The development of high-performance and durable anionic catalyst binders also referred to as anion exchange ionomers (AEIs) is the major challenge for AEMFCs [2]. This study aims to develop an improved AEI to be tested in both in-house and commercial electrocatalysts. Electrocatalytic activity using cyclic voltammetry (CV), linear sweep voltammetry (LSV), and chronoamperometry (CA) will be carried out for all the electrocatalysts with the use of the developed AEI instead of the usually used Nafion® ionomer. Characterization techniques will include transmission electron microscopy (TEM), X-ray diffraction (XRD), and energy dispersive X-ray spectroscopy (EDX) for particle size, crystal structure, and morphology respectively of the electrocatalysts. For the developed AEI dynamic light scattering (DLS) (with an ELS-Z Zeta-potential and particle size analyser), nuclear magnetic resonance (NMR), and Fourier-transform infrared spectroscopy (FTIR) for size distribution profile, material molecular structure, and composition.

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The Assessment of The Risk Factors for Building Information Modelling (BIM) Implementation in The South African Construction Industry

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Keywords: Building Information Modelling, Construction Industry, Risks, Mitigating Methods, and Benefits

Building Information Modelling is important for construction as it is implemented throughout the building's lifecycle, starting from the planning stages until the demolition [1]. This research study aimed to present a comprehensive understanding of the risk factors associated with BIM implementation within the South African construction industry and the strategies and techniques for mitigating them. To investigate the risk factors, to determine the constraints in managing risk factors, to identify risk factors mitigation strategies, and to determine the benefits of avoiding risk factors for BIM implementation. The quantitative approach for this research was adopted and the study was conducted in South Africa in the province of Gauteng. The data was collected through the distribution of the research questionnaire to the construction professionals. These participants were selected because they belong to the construction industry and that qualified them to participate in the study. A Google form survey was distributed to get the responses of the construction professionals and Architects, Quantity Surveyors, Engineers, Construction Managers, Construction Project Managers, Project Coordinators, Clients, Facility Managers, BIM practitioners, and BIM professionals were recorded on the survey.

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The development of a generic mentorship programme for female football coaches within the South African context

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Keywords: mentorship programme, coaching, female coaches, support, diversity in coaching

In South Africa, the world of football has long been dominated by men, leaving a significant gender gap within the coaching ranks. This research addresses the pressing need to empower and support aspiring female football coaches in South Africa through the creation of a generic mentorship programme for female football coaches. The aim of the study will be to develop a comprehensive and adaptable mentorship programme for female football coaches. The study's objectives are to identify the barriers and challenges experienced by female football coaches, as well as the perspectives of football experts on mentorship for female football coaches and to pilot the developed mentorship programme within a purposefully selected sample of South African Football Association (SAFA) D license female football coaches. This research adopts an exploratory sequential mixed-methods approach, combining the Delphi method with an expert panel and a quantitative questionnaire targeting aspiring coaches. The quantitative phase uncovers the barriers that female football coaches face, while the Delphi will assist in determining the content for the proposed mentorship programme as well as strategies that can be used to encourage the active participation of both mentors and mentees in the programme. Participation in the project is voluntary with no exposure to harm and respect being paramount in keeping information for the semi-structured interview confidential and the questionnaire data anonymous. Ethical approval will be sought from the Faculty of Heath Sciences (FHS) committee. The outcomes of this research will not only contribute to addressing gender inequality in football coaching but will also provide valuable insights for the development of a mentorship programme, which could be adapted for use in other sport federations. Information could also be added to SAFA's education framework and governance policy to ensure all female coaches are supported.

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Obstetricians' description of advanced midwifery practice in public health sector of South Africa

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Keywords: Advanced Midwife, Knowledge, Public health Sector, Obstetricians, skill

The Advanced midwifery specialization was introduced in 1980 as a response to escalating maternal and neonatal mortalities and shortage of doctors in rural parts of South Africa. Basic midwives were enrolled into a postgraduate midwifery studies to extend their knowledge and skills to become advanced Midwives (AM).Postgraduate midwifery aimed to enable them to work independently and collaboratively with doctors in managing high risk and complicated obstetric conditions. While AM are equipped with the knowledge and skills, they remain underutilized in the clinical facilities because of the limiting practice regulations, hospital policies and fear of litigations, which could lead to loss of skills. This study is derived from doctoral study entitled strategies to facilitate optimal utilization of knowledge and skills of AM in public and private health sectors of South Africa. One section of the study aimed to determine the optimal the utilisation of knowledge and skills of AMNNS in the private and public health sectors. This part of the study aims to explore and describe experiences of obstetricians regarding AM' utilization of their knowledge and skills in the public health sectors of South Africa. A qualitative, descriptive, explorative, and phenomenological research design was followed. Purposefully sampled obstetricians participated in a semi-structured interview. Data were analysed using Collaizi's descriptive method based on the themes and categories that emerged. Obstetricians are unable to recognize the distinction between midwives and AM because they continue to depend on them. The AM practice defensive medicine and obstetricians associated this to fear of litigations, as there are no policies in place to define AM roles and responsibilities. The study-highlighted that AM in public health sectors are unable to utilize their knowledge and skills optimally according to obstetricians, and cannot assume their specialists role.

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A social-profile-based recommendation e-learning model

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Keywords: Social Profile, E-learning, Personalised learning paths

Many High Education Institutions(HEIs) have migrated to blended or complete online learning to cater for less interruption with learning and more effective learning [1]. As such, there is a growing demand for personalized e-learning to accommodate the diversity of student's needs [2]. Personalized learning paths are one form used to personalize learning by providing learning strategies to students. Personalized learning paths can be achieved using recommendation systems powered by Artificial Intelligence(AI) [3]. Learning should not be limited to formal data but should also consider student's social profiles. A social profile consists of personal experiences and motivational external factors such as social life, health wellness, positive attitude or computer self-efficiency [4]. Therefore, collecting and identifying appropriate data to use, is necessary to determine the best recommendations for students. By reviewing the existing data collection capabilities of the Learning Management Systems(LMSs) used by public universities in South Africa, we were able to examine their readiness to create effective personalized learning paths. Results revealed that there is a gap in using student's social profile data to recommend learning paths. Thus, this research proposes that a Social Profile-Based recommendation model is a valuable enhancement for LMSs so that students can have access to personalized learning strategies. The research applies Design Science Research Methodology (DSRM) to inaugurate the proposed model that leverages further insight provided by students' social profile to recommend personalized learning paths. The research contributes to the branch of knowledge of Computer Science with a novel model for LMSs which can be further researched and extended to other learning platforms.

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Isolation and characterization of the ESKAPE pathogens from household samples collected in three study areas in Gauteng, South Africa

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Keywords: ESKAPE pathogens; community-acquired infections; PCR; Antimicrobial Resistance

The ESKAPE pathogens (Enterococcus faecium, Staphylococcus aureus, Klebsiella pneumoniae, Acinetobacter baumannii, Pseudomonas aeruginosa, and Enterobacter species) are identified as the lead cause of nosocomial infections worldwide [1]. These pathogens could evade common therapies through diverse antimicrobial resistance mechanisms and biofilm formation, and are deemed as highly virulent bacteria responsible for life-threatening diseases [2]. This study aims to study the potential for community acquired infections by isolating and characterizing the ESKAPE pathogens from water, sanitation and hygiene linked samples collected from high-rise buildings of Hillbrow in Johannesburg, representing formal dwelling structures in Gauteng. Method: Samples (n=120) were collected from 30 households in Hillbrow in June 2023. The physicochemical parameters of water (tap and stored) such as temperature (oC) and pH were tested on site. The collected water was screened for the ESKAPE pathogens by a standard membrane filtration procedure. Furthermore, biowipe was used to sample the kitchen table, toilet seat, and a hand of the tenant. Each biowipe swab was soaked into a 10 ml phosphate buffered saline (PBS) plus 0.1 % tween solution and stored at 4°C until further analysis. The DNA of each sample was extracted using the in-house method and quantified by the nanodrop spectrophotometer and used for PCR screening for the ESKAPE pathogens [3]. PCR positive were enriched with Luria-Bertani (LB) broth and the cultures plated onto each of the selective media. Colonies matching macroscopic morphology of the ESKAPE pathogens were isolated and confirmed with PCR before the identity was confirmed, and the antimicrobial susceptibility patterns determined using the VITEK-2 automated system. Results: Enterobacter spp. was the most predominant organism 82.9% (97/117), followed by Klebsiella pneumoniae 59% (69/117), and Enterococcus faecium 10.3% (12/117) respectively. Staphylococcus aureus, Pseudomonas aeruginosa and Acinetobacter baumannii were the least organisms in all samples. Conclusion: These results indicate the presence of ESKAPE pathogens in the households and potential role of improper practice of hygiene in microbial transmission and potential infection

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Life-worlds and aspirational selves of youths in contemporary Africa: A school-based ethnography in Maputo Province

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Keywords: Africa, Mozambique, rural, youth, school, ethnography, church

By the mid-21st century, it is projected that forty percent of the global child and adolescent population will reside in Africa [1], raising questions about the continent's prospects, and implications for future social and economic patterns worldwide [2]. Located on the South East African coast, Mozambique has a vast young population of around 17 million people under the age of seventeen [3], but the potential human capital of younger generations has yet to be properly integrated into the forces of socio-economic development. I am currently doing an in-depth, long-term ethnographic study on youths in their final year at a rural school in Maputo Province. Employing an ecological framework that encompasses the students' broader life-worlds beyond the school milieu, I am exploring the agency of young people as they navigate various spheres of action. This research is guided by the following questions: How do youths in rural Africa leverage the affordances from school and church in the narration moulding of their future selves? How does the intersectionality of these two institutions build masculine identities and socio-economic prospects for young men in provincial Southern Mozambique? The limitations of public schools in Sub-Saharan Africa due to poverty, remoteness, discrimination and other issues are well known and documented [4]. Despite these limitations, public schools play a crucial role as the primary access to education, requiring teachers and students to co-create a meaningful learning experience. They also offer a place for young people to gather and interact with each other, exchanging thoughts that may reflect or differ from those exercised at home and in other social spaces. As agents of sociocultural production [5], youths, adolescents and children can provide valuable lived perspectives that can inform policy interventions for their holistic development. Through a geographically located ethnography the begins in the classroom and expands to explores the life-worlds and aspirations of rural Mozambican youth, my research can contribute to discussions on education, social change, and the experiences of African adolescents and youth [6].

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Charting the cannabis plant chemical space beyond cannabinoids with digitalized LC/MSMS strategies

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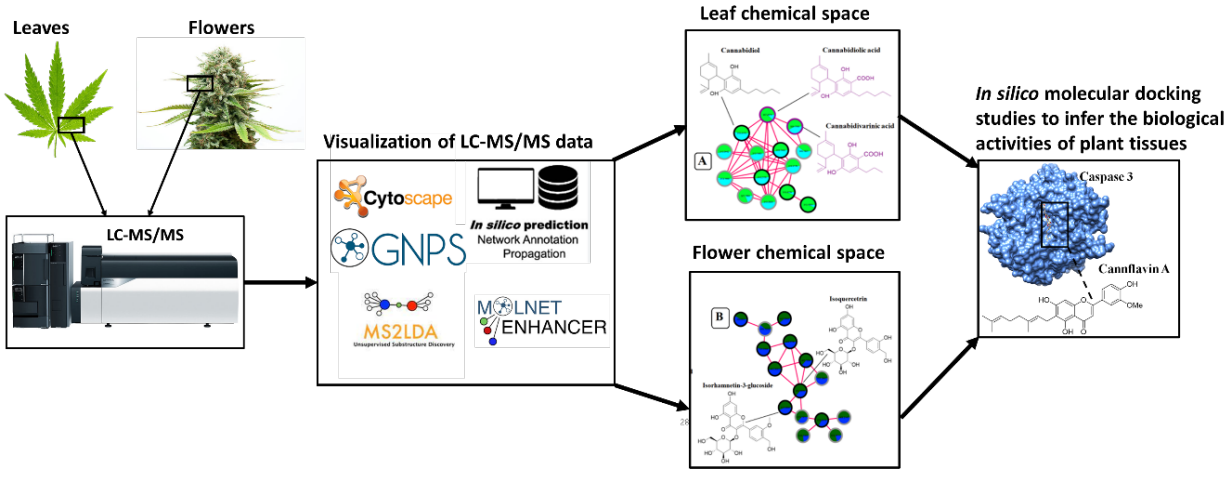
Keywords: Cannabis, Medicinal, LC-MS/MS, Computational tools, Metabolic map, Chemovar

There are currently more than 700 varieties of Cannabis of which some are used for their medicinal properties to alleviate various symptoms. The chemical classification of Cannabis is confined to cannabinoid content and yet, Cannabis encompasses diverse chemical classes that vary in abundance among all its varieties. Hence, neglecting other chemicals within Cannabis strains leads to consequences, including a restricted and biased comprehension of elements that may contribute to chemical intricacy, the physical attributes of active components, and the resultant medicinal qualities of the plant. Thus, herein we report a computational metabolomics study, involving the use of e-infrastructures and machine learning (ML) workflows, to elucidate the Cannabis metabolic map beyond the cannabinoids. LC-MS/MS analyses were performed to evaluate the methanolic leaf and flower extracts of two Cannabis cultivars (Amnesia haze and Royal dutch cheese). The generated spectral data was mined and visualized using computational and bioinformatics strategies such as feature-based molecular networking, substructural discovery method (MS2LDA), in silico tools (e.g., NAP and DEREPLICTOR+), and MolNetEnhancer. The results revealed the presence of different chemical classes such as cannabinoids, flavonoids, and phospholipids at varying distributions across the cultivar plant tissues. Moreover, MolNetEnhancer revealed that both the leaves and flowers were abundant in lipid and lipid-like molecules and this superclass was more prevalent in the flowers. The leaves were also characterized by an abundance of phenylpropanoids and polyketides. Therefore, the two cultivars were differentiated into chemovars based on the different metabolite profiles of their plant tissues. Additionally, in silico molecular docking studies in combination with biological assay studies indicated the potentially differing anti-cancer properties of the two cultivars resulting from the elucidated chemical profiles. These findings highlight distinctive chemical profiles beyond cannabinoids in Cannabis strains. Mapping these profiles provides insights into plant biochemistry and justifies selecting certain varieties for medicinal use. Such comprehensive and precise deconvolution of the chemical space of the plant contributes to ongoing efforts in cannabis research and applications; also, towards the realization of UN SDG #3, good health and well-being.

Graphical Abstract



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When Smart Things Make Us Dumb: The Mystification of Technology in Modern Design Trends

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Keywords: right to repair, accessibility of technology, practical knowledge

The advent of the Fourth Industrial Revolution has ushered in a wave of profound technological innovation with the promise of reshaping society and enhancing quality of life through smart technology. Alongside this advancement, a range of design principles and philosophies has emerged, ostensibly geared towards making technology as user-friendly and seamless as possible. This prioritisation of ease-of-use, I argue, has concerning consequences, specifically the alienation of users from the technological tools they use, as well as a learned dependence on 'approved' expertise. This paper, then, will examine the epistemic consequences that result from the prioritisation of user convenience through the concealment of the technical intricacies of contemporary technology, a phenomenon I shall term 'the mystification of technology'. The mystification of technology discourages users from delving into the inner workings of technological systems. While user-friendly design enhances accessibility, it may restrict users' ability to attain practical knowledge about the workings of the systems they use, thereby impeding innovation and eroding gains to personal agency by rendering them into being passive recipients of knowledge rather than active participants. I contend that this can cultivate a mindset in which users perceive relatively easily solvable technical problems as beyond their expertise. Furthermore, the mystification of technology extends to the deliberate design of systems resistant to user repair, enabling companies to monopolise repair services, which not only inflates repair costs but also cultivates user dependence on proprietary expertise, undermining technological self-sufficiency among users. I argue then that there is an urgent need to strike a balance between user convenience and technological literacy. To navigate these concerns, I will propose interventions aimed at empowering individuals to tinker, experiment with, and explore technology. In sum, this paper underscores the implications of prioritizing user-friendliness in modern technology. These findings hold significance for designers, developers, and policymakers committed to ensuring that technology not only enhances user capabilities but also fosters a deeper understanding in an interconnected world. As we usher in the Fourth Industrial Age, the imperative remains unequivocal: technology should empower individuals and deepen their comprehension rather than obscure and disempower them.

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Confirmation of Engineered Nanomaterials Incorporation in Nano-enabled Products Available in South Africa

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Keywords: Engineered nanomaterials (ENMs), risk assessment, transformation, toxicity

South Africa utilizes nanotechnology to promote its global competitiveness in areas including advanced materials, water, pharmaceuticals, and energy whilst growing and sustaining its economy [1]. That is being done by incorporating Engineered nanomaterial's (ENMs) in commercial nano-enabled products (NEPs) such as cosmetics, personal care products, medical devices, and electronics to improve their performance [2,3]. ENMs are not permanently fixed to the product matrix and during NEPs life cycle, may be released into the environment, particularly freshwater systems where they undergo bio-physicochemical transformation, which influences their environmental behaviour and bioavailability. The current study verified the incorporation of ENMs in NEPs as per product labels or descriptions in their formulations. ENMs were extracted from cosmetic and personal care products obtained from the South African retail market. The sample selection focussed on products that exhibit medium to high potential release of ENMs (surface coated/suspended in liquid) into water streams [4]. After extraction, physicochemical characterization of extracted ENMs was performed *in situ* using a suit of analytical instruments. Organic functional groups of ENMs were determined using fourier transform infrared spectroscopy (FTIR). Stretching/bending vibrations and bonds attributed to O-Ti-O, Zn-O, and Ag-O were observed, which confirmed the product labels or descriptions mentioning the presence of ENMs in NEPs formulation. The average particle size distribution ranged from 9328 ± 0.00 to 192.3 ± 14.34 nm, as determined by dynamic light scattering (DLS). The average size of ENMs was influenced by the large quantity of incorporation in their formulation and agglomeration rate. All the ENMs showed a similar negative zeta potential, indicating good physical stability and surface charge against coalescence when reacting with other positively charged materials. These results confirmed the presence of ENMs in NEPs. Overall, the study will advance efforts towards a realistic determination of the risk assessment of environmentally relevant ENMs, which have been recently classified as contaminates of emerging concerns.

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Synthesis of Fe3O4@SiO2 from coal fly ash and its application in wastewater for the removal of diclofenac

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Keywords: Nanocomposite; Coal fly ash; Wastewater; Diclofenac; Acid mine drainage

The increasing global pollution has raised significant concerns about the contamination of water resources [1]. In this study, a Fe_3O_4@SiO_2 nanocomposite was synthesized from coal fly ash and applied in wastewater for the removal of diclofenac (DCF). The co-precipitation method was used to synthesize magnetic silica nanoparticles from an abundant industrial waste (coal fly ash) [2], by incorporating it with magnetite (Fe_3O_4) prepared from acid mine drainage (AMD) [3]. The prepared nanocomposite was characterized using transmission electron microscopy (TEM), fourier-transform infrared spectroscopy (FTIR), x-ray diffraction (XRD), and scanning electron microscopy-energy dispersive X-ray analysis (SEM-EDX) to analyze the structure, morphology, and elemental composition. When Fe_3O_4@SiO_2 was applied to mitigate DCF from wastewater through batch experiments, the effects of various parameters including pH, nanocomposite dosage, and sample volume were systematically evaluated. Under optimum conditions, the equilibrium kinetics and isotherms were studied, as well as the adsorption mechanism. The detection of the analyte was achieved using high-performance liquid chromatography with diode-array detection (HPLC-DAD). Overall, this work demonstrated that Fe_3O_4@SiO_2 nanocomposite could be successfully prepared from coal fly ash and could be used in wastewater to remove DCF.

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Abstracts

Poster Category

Masters

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Investigation of the anticancer activities of novel flavonoid compounds isolated from the medicinal plant Erythrina abyssinica

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According to WHO, the rising cancer burden is putting a strain on the healthcare system, and people living with the disease experience mental, physical, and emotional distress [1]. Conventional therapies have limitations such as non-selectivity, detrimental effects on healthy cells, secondary recurrence, metastasis, and cancer becoming resistant to treatment. Therefore, it has become critical to identify effective, biofriendly, and affordable alternative cancer treatments. For many years, plants have played an important role in developing anticancer medications, and natural compounds derived from these plants have been a rich source of anticancer agents [2]. This study aimed to isolate and characterize flavonoids found in Erythrina abyssinica, conjugate them to metallic nanoparticles, and test them for anticancer activity. The in vitro studies showed that non-conjugated 5-methoxyjamaicin had cytotoxic activity against pancreatic and cervical cancer and showed no cytotoxicity against normal cells. This cytotoxic activity was accompanied by intrinsic apoptosis induction that was characterized by high caspase activity, low ATP levels in cancer cells, changes in the cell and nucleus morphology, and inhibition of metastasis. Furthermore, the conjugation of the compound to silver nanoparticles resulted in the cytotoxic activity that was much higher than that of the non-conjugated compound. Despite the fact that conjugating this compound increased its cytotoxic activity against malignant cells tremendously, it proved damaging to healthy normal cells. Given that this is an ongoing study, further research is needed to identify and understand other biological processes and cancer-associated genes that the compound may impact and examine how to improve the delivery of this compound without eliciting adverse effects on normal cells.

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Grade 9 learners' errors and misconceptions when working with algebraic equations at a Johannesburg high school

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South African learners' mathematics performance is poor across all topics, but especially in algebra [1]. There are several reasons for this, not least the extensive use of variables in the topic. Learners commit many different types of errors when solving algebraic equations, and the teacher's responsibility is to identify and address these errors [2]. This poster reports on the preliminary findings of a master's study in which grade 9 learners from a Johannesburg high school were asked to answer an assessment task that contained different types of algebraic equations. The learners' responses were inductively analysed, and the errors they committed were categorised into groups. Some misconceptions were also inferred. The errors included (among others): learners' difficulties with addition and subtraction of like/unlike terms; challenges when dividing terms and when solving for x; incorrect application of the distributive rule (including operation error); poor conceptual understanding of the lowest common denominator (LCD) when simplifying fractions; errors when transposing terms; equals sign error; and misapplication of exponential laws. Two mathematics teachers were interviewed, and their knowledge of learner errors, when working with algebraic equations, was elicited. The researcher sought to find a relationship between the learners' errors and the teachers' declarative mathematical knowledge for teaching.

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Proteomic variations between African scorpion venoms and identification of therapeutic properties through *in vitro* cell line assays

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Keywords: Antivenom, Cancer, Proteomics techniques, Scorpion envenomation, Therapeutic agents

Scorpion stings are the second most global cause of envenomation, especially in tropical and subtropical regions, after snakebites. Scorpion envenomation poses a significant public life-threatening problem, with some patients experiencing clinical symptoms and severe complications, including death caused by the components found in scorpion venom, such as neurotoxic proteins [6]. Besides the neurotoxic proteins, scorpion venom consists of bioactive molecules that can be used to develop new therapeutic drugs against cancer and other emerging diseases [2,5]. Antivenoms are the only treatment for envenomation, but they are costly, not easily accessible, and some are ineffective in severe envenomation due to these species' variations [4]. People from subtropical and tropical regions are most affected since they do not have proper healthcare facilities. Currently, there is a shortage of scorpion antivenom, and Southern and Northern Africa are known to be the home of dangerous scorpions that can cause life-threatening problems [4]. Due to the above reasons, this study aims to determine the proteomic profile variations of Southern and Northern African scorpion venoms using proteomic techniques such as one-dimensional (1-D) and two-dimensional (2-D) gel electrophoresis, enzymatic assays, reverse phase high-pressure liquid chromatography (RP-HPLC), and MALDI-TOF which will reveal the intra- and inter-species variance concerning sex, diet, age, geographical location [1,3,5]. Due to the scorpion venom not only being a threat to human health, this study will also focus on finding new therapeutic agents against cancer in scorpion venom. The data obtained will provide a better understanding of the manufacturing of scorpion antivenom serum and potential components that can be used in anti-cancer studies.

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Fabrication and performance evaluation of cellulose nanocrystal-based polymeric membranes for antibiotic removal from wastewater

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Keywords: Antibiotics, Cellulose nanocrystals, Polymeric membranes, Polyethersulfone, Nanofiltration

The high rate of TB infections in South Africa has resulted in increased use of TB antibiotics and thus their availability in the aquatic environment [1]. The release of antibiotics into the environment has become a major concern as they have health impacts on humans and marine life. Therefore, the development of robust polymeric membranes with antifouling properties has aroused the interest of researchers to combat these challenges. This study for the first time modifies the surface of a polymeric membrane to improve its anti-fouling properties using cellulose nanocrystals (CNCs). CNCs were prepared by sulfuric acid hydrolysis of a commercial microcrystalline cellulose [2]. The synthesized CNCs were then embedded into a dope solution containing N-N-Dimethylacetamide (DMAc), the solvent, Polyvinylpyrrolidone (PVP) the pore former and the polyethersulfone (PES), the polymer [3]. The membrane was then fabricated by the wet phase inversion technique using a casting blade with 150 µm thickness [3]. The physicochemical properties of the CNCs and the fabricated membrane were analyzed using different analytical techniques such as Scanning Electron Microscopy (SEM), Water Contact Angle (WCA), Thermogravimetry Analysis (TGA), Atomic Force Microscopy (AFM), Fourier Transform Infra-red (FTIR), to check the surface morphology, hydrophilicity, thermal stability, surface roughness, and surface functional groups, of the synthesized CNCs and the fabricated membrane, respectively [3], [4]. The performance of the fabricated membrane was evaluated using a dead-end filtration cell with pressures ranging from 14.5 to 52.5 psi at room temperature [5]. The synthetic antibiotic wastewater was prepared by dissolving 1 g of rifampicin in 1 liter of deionized water and then left to thoroughly mix and dissolve for 24 hours before running the tests [6]. The SEM image showed a thin, but dense skin layer. The PES-CNC membrane showed a significantly higher hydrophilicity and higher water flux, compared to pure PES membrane [3]. Likewise, the loading of CNCs at 0.8 to 1.2 wt% in dope solution resulted in higher water permeability [4]. Furthermore, the results showed membranes incorporated with CNCs had about 20% higher antibiotics removal and enhanced flux recovery when compared to PES membranes without any CNCs [4]. The successful development of CNC-based polymeric membranes that can effectively remove antibiotics from wastewater will greatly assist in improving the current wastewater treatment to remove TB-containing antibiotics.

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Investigation of transport and fate of transport of selected potentially toxic elements in Mokolo River and potential health risks to human health

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Keywords: Mokolo River; potentially toxic elements; soil; sediment; water; water; inductively coupled plasma mass spectrometry, health risk assessment; As; Pb; Cd; Ni; Cr; Cu; V and Hg

Potentially toxic elements (PTEs) are introduced into water bodies through untreated industrial effluents, agricultural, mining and smelting activities [1-4]. This study aimed to assess the levels of selected PTEs, which include cadmium (Cd), nickel (Ni), copper (Cu), mercury (Hg), chromium (Cr), arsenic (As), vanadium (V) and lead (Pb) in water and sediment samples collected from Mokolo River as well as in soil and vegetable samples collected from the farms in the vicinity of Mokolo River. The concentrations of these selected PTEs in water, sediment, soil, and vegetable samples for both high and low flow seasons, were quantified by inductively coupled plasma-mass spectrometry (ICP-MS). The methods employed for analysis of water, sediment, soil, and vegetables were optimized and the accuracy was confirmed using standard reference materials (SRMs). The difference in concentrations of these selected PTEs were observed between high and low flow seasons for water and vegetable samples. Lower concentrations that are within the maximum permissible limits (MPLs) recommended by World Health Organization (WHO), South African National Standards (SANS) and Department of Water Affairs and Forestry (DWAF) were detected in the water from Mokolo River for both high and low flow seasons. Whereas high concentrations that surpassed the MPLs recommended by WHO & Food and Agriculture Organization (FAO) were detected in vegetables samples. However, the health risk assessment (HRA) revealed that the health of the adult population is not threatened, whereas the health of the children population is threatened with consumption of these vegetables.

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Stakeholder Perceptions on the State and Status of Public High School Sport in uMngeni Local Municipality

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Keywords: School Sport, Public Schools, Internal Stakeholders, Policy Implementation

The South African government priorities school sports for their positive impact on learners' development and educational goals. Over the period from 1994 to the present, four policies, including The White Paper on Sport and Recreation (1996, 2012), the School Sport Policy (2011), and the Memorandum of Understanding (2011) have been established to guide sports delivery in schools. Despite these policies, non-compliance in schools is evident. Literature highlights distinct challenges in implementing school sports, with variations between quintiles one to three schools and quintiles four to five schools (Burnett, 2020). However, research on school sports policy implementation, especially from stakeholder perspectives, is limited. The partially mixed methods dominant status (QUAL-quant) study examined the state of school sporting resources, and the nature of inter and intra-school sports participation, and gained insight from the perspective of stakeholders on the current practices of school sports. Although a mixed methods study, only the qualitative results are reported. Stakeholders of two schools (one quintile onethree and one four-five) within uMngeni Local Municipality were included in the study. Principals (n=2), heads of sport (n=3), and School Management Team members (n=2) participated in semi-structured interviews whereas Perant Members of the School Governing Body [(SGB) n=6] and learners (n=14) participated in focus group discussions. Their responses were analysed thematically using Atlas.ti version 9.1.6. The study revealed that lower quintile schools depend on national norms and standards funds, lacking sufficient resources for effective sports implementation. Conversely, higher quintile schools, enabled by school fees, allocate dedicated budgets for sports, ensuring better resources. Lower quintile schools often lack sports days, while higher quintile schools engage in inter-house programs and sports leagues. The Department of Education (DOE) significantly influences sports practices in lower quintile schools, while DOE guidelines sometimes hinder sports delivery and higher quintile schools focus on acquiring better resources. While some policy aspects are acknowledged, individual schools drive sports activities. Enhanced government support and intervention are needed for successful school sports implementation.

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Supporting the youth of Diepkloof Soweto who are addicted to nyaope through Christian healing

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Keywords: Nyaope, healing, Christian churches

Diepkloof is a large zone of Soweto home to many youths addicted to a psychoactive drug, whoonga famously known as nyaope. This study aimed to identify ways in which Christin churches can intervene to combat drug addiction among the youth of Diepkloof Soweto. The research aimed to answer the following question: How can the three selected Christian churches intervene to support the youth addicted to nyaope? Nyaope is a social issue that negatively affects society and the user's mental health [1]; it is a mixture of heroin and dagga sold in packets of R30 that is either heated in a foil and inhaled or rolled with marijuana and smoked [2]. A small dose effect includes a euphoric rush and a sense of warmth, whereas a larger dose provides a feeling of drowsiness, comfort, safety, and relaxation [2]. A few studies were conducted on the intervention by churches and faith groups in black communities in addressing drug addiction amongst the youth of South Africa and have proven a correlation between drug addiction and the lack of religion [3]. The study employed the qualitative research methodology in which semi-structured interviews were conducted with purposefully selected research participants from one mainline Christian church and two African Independent Christian (AIC) churches based in the Diepkloof Soweto community. Data collected from the interviews was analyzed systematically using Atlas-ti software. The analysis involved transcribing verbatim stories shared by participants and coding them to identify themes and sub-themes[4]. Healing was the main theme identified from the conversations held with residents of Diepkloof who attended these three churches and were divided into sub-themes. The concept of healing was expressed in our conversations, and the research participants suggested that the church can use healing to support the youth addicted to nyaope.

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Phytochemical evaluation of traditional medicinal plants towards the discovery and development of new antimalarial drugs

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Keywords: Malaria, Plasmodium falciparum, Resistance, Medicinal plants, Computational chemistry

Malaria is a vector-borne disease caused by five *Plasmodium* parasites, with P. falciparum being the most virulent and lethal causative agent of malaria [1]. This persistent killer disease has resulted in over 229 million clinical cases and 409,000 deaths globally with 94 % of the reported cases occurring in Africa and 274 000 of the confirmed deaths occurring in children under the age of five [1-2]. Further, due to the increasingly reported incidences of the emergence of resistance that has rendered most of the commonly used antimalarials such as chloroquine and artemisinin ineffective, there is an urgent need and call to find new alternative strategies that can help in this regard [1-3]. Throughout history, people have always relied on medicinal plants to meet their basic healthcare needs. As such medicinal plants are now seen as a promising and appealing avenue due to their rich biodiversity, deep historical usage, and complex therapeutic phytochemicals [3]. Moreso, what makes medicinal plants even more appealing is the fact that some of the widely known antimalarial drugs such as chloroquine and artemisinin were plant-derived. Therefore, this study seeks to explore and harness medicinal plants, validate their use in folk medicine, and target some of the active bioactive compounds against some of the malarial proteins deemed essential for the survival and development of *P. falciparum* [4] using computational chemistry/molecular docking and *in vitro* assays.

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Perceptions of senior phase Natural Science and Technology teachers towards their training in Coding and Robotics

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Keywords: coding, robotics, perceptions

Educators actively expand their professional expertise as they prepare to instruct and engage with students, colleagues, and peers within the academic community. Understanding teachers' perspectives on professional development is of paramount importance as it enables them to adapt to the evolving curriculum and the integration of technology. Previous research underscores the ever-changing nature of the school curriculum, especially with the introduction of Information Communication Technology (ICT), necessitating continuous professional development for teachers in the educational sector. Researchers have emphasized that teacher training not only impacts the quality of teaching but also pedagogical approaches and student outcomes. This study adopts a constructivist interpretivist paradigm to guide its investigation, employing a combination of interviews, lesson observations, and qualitative questionnaires to gather data. The study's objective is not to establish an ultimate truth but to offer a specific perspective and derive meaningful insights into the subject of inquiry. The findings underscore the pressing need for teacher professional development, revealing a gap in the training of educators, particularly in the context of Natural Science and Technology instruction. This study highlighted the negative perceptions among Natural Science and Technology teachers regarding their preparedness in areas such as coding and robotics. It is evident that additional professional development and training are essential to equip these teachers with the necessary skills to seamlessly integrate these technological elements into their lessons. This, in turn, promotes a learner-centered classroom environment that fosters authenticity and creativity among students. In accordance with teachers' perceptions, it becomes evident that Natural Science and Technology educators require extended training opportunities to gain a deeper understanding of coding and robotics, thus enhancing their ability to impart knowledge effectively to their students.

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Evaluating water, sanitation, and hygiene (WASH) access in rural government health clinics within the Albert Luthuli Municipality of the Mpumalanga province, South Africa

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Keywords: Water, Sanitation, Hygiene, Healthcare facilities, Water quality

Several deaths and the spread of infectious diseases particularly in healthcare facilities (HCFs) have been linked to poor water, sanitation, and hygiene (WASH) services all over the world [4;5], and this has been proven to be more intense in rural healthcare settings in developing countries [1;2]. This problem is exacerbated by intermittent water supply in these facilities, which increases the rate at which healthcare-acquired infections (HCAIs) spread [5]. Moreover, the quality of drinking water is poor in most developing countries, severely in rural areas, and HCFs in rural settings, which threatens human health [3]. Studies focussing on WASH in rural HCFs in South Africa are limited. As a result, the current study was carried out to evaluate access to WASH services and water quality in rural healthcare clinics within Albert Luthuli Municipality, in the Mpumalanga province in South Africa. The standardized WHO checklist for assessing WASH in HCFs was used, together with semi-structured interviews with the clinics' facility managers to obtain information on WASH aspects of the clinics. The drinking water samples collected in the clinics were analysed on-site for pH, temperature, electrical conductivity, turbidity, total dissolved solids, free and total chlorine, while microbial indicators (Total Coliforms and *E. coli*) were analysed at the laboratory. The results showed limited-service access to WASH in 82% of the clinics. Water was not always accessible from the clinics' improved water sources, and when accessible it was not sufficient for use. Sanitation and hygiene indicators were not met at the required basic level. The quality of water was poor as the results presented varying degrees of non-compliance of the parameters to the WHO guidelines and the South African National Standards for drinking water. There was at least one waterborne pathogenic strain of *E. coli* in 70.6% of the clinics. Based on the results of this study, it is recommended that the municipality improves water supply in the clinics to improve health outcomes. Water should be treated effectively to improve its quality and kill microbes. There should be regular WASH monitoring for improvements to occur continually in the clinics. Training and educational programs should also be prioritized for patients and healthcare workers in the clinics to expand the knowledge base on the importance of WASH and compliance with Infection Prevention and Control Protocols (IPCPs).

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Isolation and characterization of ESKAPE pathogens from greywater collected in the Zandspruit informal settlement in Gauteng, South Africa

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Greywater is a source of recent concern for the emergence of antimicrobial resistance and highly virulent, *Enterococcus faecium, Staphylococcus aureus, Klebsiella pneumoniae, Acinetobacter baumannii, Pseudomonas aeruginosa*, and *Enterobacter* spp. (ESKAPE) pathogens. The lack of infrastructure, poor water availability and accessibility, and absence of rules regarding the disposal of greywater in informal settlements influence the reuse of greywater in households. Greywater is described as residential wastewater that comprises water from bathtubs, showers, basins, and laundry machines but excludes toilet water. The poor disposal of the greywater on the open land puts the residents of the informal settlement at serious risk of exposure to these pathogens. This study investigated the occurrence of ESKAPE pathogens in greywater collected from the Zandspruit informal settlement in Gauteng, South Africa. General physical-chemical and microbial water quality testing was done according to SANS241 guidelines. Ninety-seven household greywater and discarded surface run-off greywater samples were analysed for the ESKAPE pathogens using appropriate selective culture media according to the recommended methods. Microbial colonies matching macroscopic morphology of the ESKAPE pathogens were isolated and sub-cultured for further confirmation by PCR. A total of 211 presumptive isolates were tested and 12/29 *E. faecium*, 73/128 *K. pneumoniae*, 0/25 *A. baumannii*, 4/5 *Pseudomonas aeruginosa*, 20/24 *Enterobacter* spp were confirmed with PCR as that species. Interestingly no *Staphylococcus aureus* were detected. This study has shown that ESKAPE pathogens are slowly migrating into communities and that greywater could be potential source of infections. The results of the research will help the Zandspruit informal settlement to be alert to the presence of these potentially dangerous ESKAPE pathogens in the greywater which will ease the burden posed on the health care facilities.

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In silico guided search for COVID-19 druggable compounds from medicinal plants: A network pharmacology and molecular docking study

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Keywords: Molecular Docking; Network Pharmacology; Natural Products; Drug discovery; COVID-19

When the coronavirus disease pandemic of 2019 hit, it sped up the process of developing drugs and vaccines and brought together scientists from all over the world to discover effective treatments for the virus. Despite the approval of several safe and effective vaccines, the problem remains unaddressed for those with underlying medical conditions and those living in underprivileged areas without immunisations or proper medical infrastructure. This is especially difficult as new SARS-CoV-2 strains arise. This study focuses on labdane diterpenoids from Leonotis leonurus and L nepetifolia, which are widely reported to possess anti-inflammatory and antiviral activities. For instance, Leonurine compound is in the clinical stage due to its considerable therapeutic effect on cardiovascular system-related diseases. However, the antiviral and therapeutic effects of the labdane diterpenoids against SARS-Cov-2 and potential protein targets remain unclear. The study aimed to decipher the ability of labdane diterpenoids from the L. leonurus and L. nepetifolia plant species to inhibit COVID-19 disease infection/progression and alleviate COVID-19 symptoms in infected patients. Protein and compound structures were downloaded from public databases. Molecular docking was used to study compound-protein interactions and network pharmacology was used to study the action mechanisms of ladbane diterpenoids in alleviating COVID-19 symptoms. On network pharmacology analysis, the therapeutic targets were predicted using a Python based script by incorporating a Binding DB dataset. Human therapeutic targets-signaling pathways were predicted using KEGG and GO pathway enrichment analysis and the interactions were validated by molecular docking analysis. This approach enabled us to concentrate on viral proteins as the primary targets for COVID-19 and demonstrates that some human proteins may also be crucial in the search for COVID-19 drugs. Thus, the study found that inhibiting viral proteins helps prevent COVID-19 infections/replication, while inhibiting COVID-19-associated human targets may alleviate COVID-19 symptoms and lower the disease's fatality rate. The results serve as a thorough reference for additional research that uses in vitro and in vivo methods to examine the behavior of these substances on SARS-CoV-2 infected models. Thabo Ramatapa Department of Biochemistry, University of Johannesburg, Kingsway

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Take it Like a Man! An Investigation into the Discourses of Female Perpetrated Intimate Partner Violence Against South African Heterosexual Males on Facebook.

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The perpetration of intimate partner violence (IPV) by women against men in heterosexual relationships is a serious problem in South Africa. Male victims of IPV are prone to physical and mental health illnesses as a result of their victimisation [1]. Men are often mocked, ridiculed and labelled as weak when they publicise their victimisation [2]. Therefore, they prefer to remain silent about their experiences, making this a hidden phenomenon [3]. Online discourses from the *Ask a Man* Facebook group from the period of 2018 to 2022 were analysed using critical discourse analysis to gain further insight into female perpetrated IPV. The findings revealed that South African men experience all forms of IPV perpetrated by their female partners. The findings also revealed that women used various linguistic strategies to justify, legitimise and naturalise their violence against men in order to make their perpetration appear normal. Last, the study showed that men are held responsible for the awareness of their own victimisation and should publicly speak out in order receive help. This study recommends that future research focus on strategies to encourage male victims to publicise their victimisation in order to normalise and reduce this problem.

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Understanding the physics of short gamma–ray transients from compact binary mergers and magnetars

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Short gamma-ray bursts (SGRBs) are highly energetic impulses of gamma–rays with emissions that last for less than 2 s and have a hard spectra [1]. They originate from compact binary mergers like neutron star–neutron star systems [2, 3] hence making them to be ideal candidates to study the universe. However, similar short–lived sources that are galactic can be easily confused with these cosmological sources and they are called magnetar giant flares (MGFs). MGFs originate from highly magnetised neutron stars called magnetars which occur in the Milky–way and nearby star-forming galaxies [4]. When MGFs are observed at cosmological distances only their prominent peaks are observed hence can be confused with the cosmological SGRBs hence hindering cosmological studies. The prominent peaks of both

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Constraints of teachers and learners on online learning in disadvantaged schools: Perceptions of women school leaders

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Keywords: Covid-19, Online learning, TPACK, women leaders, QDA, disadvantaged schools

The Covid-19 pandemic was a game changer in all aspects of life, including education as it led to school closures. Therefore, online learning was the next best strategy to ensure continuity of teaching and learning. The problem in the study reports on the perceptions of women leaders of constraints faced by teachers and learners in disadvantaged contexts during the Covid-19 pandemic. The study further reports on how women school leaders used the Technological Pedagogical Content Knowledge (TPACK) as a guide to integrating technology and embracing online learning. Online learning is the teaching process that includes using technology an instrument to teach students [3]. Therefore, TPACK is relevant as it holistically integrates content, pedagogy, and technology. The TPACK approach also includes expert, peer, self and teacher's competencies. Therefore, TPACK is a valuable framework for women school leaders that can be used to assess the use of technology by teachers and learners using various assessments [1]. This was a qualitative research study, the phenomenological design was used to conduct this study. Phenomenology is a study that describes how individuals experience a specific phenomenon [2] Therefore, the researchers using phenomenology seek to understand how people's lives are organised and structured. The sample included women principals, deputy principals, Head of Departments (HODs) and grade head teachers. The sample sites were three South African public schools that were funded by the government, these schools are in the Gauteng province, in the East rand and they were ranked Quintile 1. Data was collected using online individual semi-structured interviews and biographical questionnaires. The QDA miner lite software was used to categorise and code interview transcripts, preparing it for an analysis report. The study illuminated that TPACK can be used as a teacher developmental tool and a reflective tool that will assist educators in integrating the use of technology in their classrooms during and post-Covid-19.

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A systematic cultivation approach coupled with untargeted metabolomics workflows reveal bioactive compounds with antibacterial properties from an endophytic fungus, Alternaria alternata P02PL2

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The World Health Organization (WHO) has classified antimicrobial resistance (AMR) among the top ten global health threats [1]. This is because of the rapid increase in AMR and the paucity of new drugs that could mitigate the challenge of multidrug-resistant pathogens [2]. The evolution of advanced sequencing technologies has made microbial whole genome data easily accessible. This data has revealed that microorganisms such as fungi harbor an enormous biosynthetic potential entrapped in biosynthetic gene clusters (BGCs) typically clustered in highly regulated sub-telomeric regions of the chromosome [3]. This location often leads to silencing or transient expression of these biosynthetic pathways resulting in bioactive compound levels that cannot be detected using standard cultivation conditions [4]. We have identified an endophytic fungus, Alternaria alternata isolated from a medicinal plant, Sclerocarya birrea, that exhibits antibacterial activity against two contemporary clinical isolates, a Gram-negative multidrug-resistant Pseudomonas species and a Gram-positive methicillin-resistant Staphylococcus aureus (MRSA). Here, we report the optimization of bioactivity production by systematic variation of cultivation conditions, following a one strain many compounds (OSMAC) approach. This approach was coupled to an untargeted metabolomics profiling workflow based on the high-resolution liquid chromatography-tandem mass spectrometry (HRLCMS/MS) and Global Natural Products Molecular Networking (GNPS) analysis to predict the compounds responsible for the antimicrobial activities. The findings obtained from this study can be used to isolate and purify the bioactive compound and to link it to its encoding biosynthetic pathway.

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Improving the antibacterial effect and physicochemical properties of Solid Lipid Nanoparticles loaded for diabetic wound healing

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In recent decades, Solid Lipid Nanoparticles (SLNs) have demonstrated their potential as an alternative drug delivery system by overcoming the limitations of polymeric micro and nanoparticles, liposomes, and emulsions [1]. Solid lipid nanoparticles are site-specific and sub-colloidal lipid-based nanoparticles composed solid lipid core (within which the drug is located depending on its hydrophobicity or hydrophilicity) surrounded by a surfactant, which increases the drug stability, the stability and entrapment efficacy of the drug-loaded system. These particles have numerous benefits, including safeguarding sensitive compounds from harmful environmental factors like moisture, light, and pH [2,3]. Additionally, SLNs have also been found to enhance the biocompatibility and delivery of lipophilic and hydrophobic drugs that contain natural active ingredients, such as Tea Tree Oil (TTO) and Lauric Acid (LA) in various medical applications [4,5,6]. Therefore, the present study aimed to formulate, characterise, and determine the antibacterial effect of LA and TTO-loaded Solid Lipid Nanoparticles (LT-SLNs), including safeguarding sensitive compounds against harmful environmental factors such as moisture, light, and pH levels. The LT-SLNs were prepared by homogenisation method at 17,500 rpm for 30 minutes. The surface charge, composition, and appearance of LT-SLNs were analysed using zeta-potential and particle size, HR-TEM, XRD, and FTIR. To determine the efficacy of LT-SLNs against bacterial cells, Pseudomonas aeruginosa was used. Evaluation methods included bacterial Growth Kinetics, Kirby-Bauer Disk Diffusion, Live/dead cell analysis using flow cytometry, and bacterial membrane damage study were performed. The SLN and LT-SLNs were well-designed with good physicochemical properties and biocompatibility, which allowed them to penetrate deep into the bacterial membrane of P. aeruginosa, displaying their antibacterial effect. This makes them suitable for the treatment of pathogen-infected wounds.

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Fabrication of active and intelligent bio-based edible films using encapsulated beetroot powders for smart packaging

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Keywords: Encapsulated beetroot waste powder (EBWP), cellulose nanofiber (CNF) and fourth industrial revolution (4IR)

In the search for eco-friendly and multipurpose food packaging, interest in bio-based edible films with active and intelligent properties is expanding. The Fourth Industrial Revolution places a strong emphasis on environmental effect mitigation and sustainable methods. When compared to conventional petroleum-based products, biobased materials and packaging are more sustainable because they are made from renewable resources. This fits with the 4IR's emphasis on resource efficiency and eco-friendly manufacturing. An advancement in material science can be seen in biodegradable active and intelligent materials. The present investigation fabricated an innovative edible film capable of proactive food quality monitoring and shelf-life extension using a bioactive ingredient from encapsulated beetroot waste powder. This was achieved by incorporating both bioactive and biodegradable encapsulated beetroot wate powder (EBWP) at different concentrations (0%, 0.5%, 1%, 1.5%, and 2%) into a composite matrix of 4% Ficus mucilage, 4% cellulose nanofibers (CNF), and 30% glycerol. Scanning electron microscopy showed that the film with 2% beetroot powder exhibited uniform diffusion and a smooth texture within the mucilage/CNF/glycerol matrix, unlike films with lower concentrations, which showed cracks and irregularities. Significant improvements were observed in film thickness, 2,2-diphenyl-1-picrylhydrazyl (DPPH), and water vapour barrier characteristics upon adding beetroot powder, notably at the 2% EBWP. Furthermore, the antioxidant and antibacterial properties of the film were primarily attributable to the EBWP, regardless of the concentration. The colour of the packaging showed pH-dependent shifts, varying from red to blue and yellow as the pH was adjusted from 2 to 13, which is an incorporation of the internet of things (IoT) technology suggesting suitability for monitoring food quality and give real-time information. Customer engagement, quality assurance, and supply chain management can all benefit from this data. The 4IR's key element, IoT, enables networked and data-driven activities. Films without EBP had lower moisture content (18,88%) than those with EBP (24,53%, 54,88%, 46,10% and 59,09%) respectively. Overall, by adopting a bio-based material that is biodegradable and reusable, promoting circular packaging, and reducing waste in the environment, the study benefited the circular economy. mucilage/CNF/glycerol incorporated with 2% EBWP demonstrated the feasibility of creating active and intelligent bio-based edible films and holds considerable promise for environmentally conscious and functional food packaging applications.

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Stories in Song: Investigating the Similarities and Differences Found in The Qualities and Narratives of Popular Songs in South Africa vs The World

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Keywords: Popular Music, Musical Narrative, Narrative Analysis, Decolonial Music Theory

Popular music is a complex global phenomenon which needs investigation and understanding. This study uses an interdisciplinary approach which features a decolonial take in its theoretical underpinnings to explore the aesthetic and narrative patterns present in popular music from South Africa and the global music scene. Using Spotify data from the first quarter of 2022, I compare the top 5 songs from both regions. My analysis aims to reveal the unique characteristics that define popular music, emphasizing its cultural significance and emotional impact. This research bridges the gap between formalist and comprehensive music analysis, recognizing music as an integral part of culture.

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Spectroscopic characterization of S. mansoni glyceraldehyde-3-phosphate dehydrogenase~triosephosphate isomerase protein complex for anti-schistosomal therapeutics

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Keywords: Schistosomiasis, Praziquantel, GAPDH, TPI, Glycolysis, Anti-schistosomal drugs

Praziquantel (PZQ) is the only drug used to treat schistosomiasis over the past 50 years in endemic regions. This drug is primarily mass-administered in sub-Saharan Africa due to its minimal side effects, cost-effectiveness, and its ready availability. However, recent studies have found that some Schistosoma strains have become tolerant and resistant to the drug due to drug pressure. In addition, the drug fails to target the parasite during its most crucial developmental stage. During this stage, the parasite releases eggs trapped in host tissue, which may cause chronic schistosomiasis, predisposing individuals to opportunistic diseases such as cancer due to the tissue releasing proteolytic enzymes from entrapped eggs. Furthermore, PZQ does not boost the antibodies required for future recognition of schistosomiasis, which means that individuals who were once cured are still prone to reinfection. Likewise, PZQ also does not aid in eliminating transmission of the disease. Therefore, it is crucial to develop new drugs to overcome decreased efficiency and reduce drug resistance of schistosome worms to PZQ. Glycolytic proteins have gained interest as possible drug targets and vaccine candidates for schistosomiasis. However, since proteins do not function alone, disrupting critical protein-protein interactions using small molecule inhibitors has become a more promising approach to resolving drug resistance in schistosomiasis. GAPDH and TPI are glycolytic proteins that play a vital cooperative role in energy production for schistosomes and help elicit an antibody response, which aids in the parasite's survival. Therefore, disrupting the GAPDH~TPI protein complex should decrease the worms' energy levels and thus create an unfavourable environment for the parasite to thrive. Hence, this study aims to characterise the N-terminal domain of the GAPDH~TPI protein complex toward the discovery, design, and development of new anti-schistosomal drugs.

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Effective teaching and learning of any subject, including history, is vital if good results are to be achieved in FET grades 12. Considering the nature of the subject – history, this means that history teaching should include historical inquiry- critical thinking, analysis, synthesis, and evaluation, to mention a few if the process is to be deemed effective. Meanwhile, learners' results should either be average or above, and change should be observable among learners both at school and in their communities. Adversely, most of the history learners in Bohlabela and Ehlanzeni districts have struggled to produce high-quality results. Most of the results were dominated by a level 2 (30-39 percent) pass rate for the learners who sat for the examination. Upon such analysis of the grade 12 results, one deduced that teaching and learning of history in these districts experience challenges. This study followed the qualitative research approach methods namely, individual interviews, observations, and document analysis to explore the challenges of history teaching and learning in the two districts. The findings indicated that various challenges emanate from teachers, learners, and the Department of Education distinctly. Based on the findings, the researcher suggests collaboration among all educational stakeholders, parents, and learners to ensure that teaching relates to the nature of the subject to achieve the objectives of CAPS history.

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Metabolomic profiling of a marine endophytic fungi, Penicillium thomii with anti- mycobacterial properties

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Keywords: Mycobacterium tuberculosis, Fungi, anti-tuberculosis drugs, untargeted metabolomics

The prevalence of multi-drug-resistant Mycobacterium tuberculosis, a major public health problem, is a causative agent of tuberculosis [1]. Although there are effective drug combinations that have achieved positive outcomes in the fight against tuberculosis, these efforts are undermined by the increasing resistance, leading to limited treatment options [2]. Advances in genomics and metabolomics have revealed that microorganisms such as fungi are host to a large untapped repertoire of chemical structures that can be potential drug candidates [3]. In our group, a marine-derived endophytic fungus, Penicillium thomii was shown to exhibit anti-mycobacterial properties with an MIC of 12 µg/mL against M. smegmatis Mc2 155 during pre-screening. This isolate is a potential source of chemical scaffolds that can be developed into drug candidates to meet the demand for new and effective anti-tuberculosis drugs. Here, we explored an untargeted metabolomics approach based on high-resolution liquid chromatography-tandem mass spectrometry (HRLCMS/MS) and molecular networking using the Global Natural Products Molecular Networking (GNPS) to predict the bioactive compound responsible for the observed anti-tuberculosis activity. The results from this study will assist in isolating and purifying the bioactive compound and linking the compound to its biosynthetic pathway.

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The Prevalence of Abnormal CD4+ counts and Viral loads in PLHIV after SARS-CoV-2 Infection: An Evaluation of Routine Results Before and After the Pandemic, at PathCare Laboratories, in Gauteng

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In 2020, the world was hit by the unprecedented coronavirus disease 2019 (COVID-19) pandemic. This global health crisis had far-reaching consequences, not only for public health but also for various aspects of healthcare, including the control of HIV. The emergence of the COVID-19 pandemic significantly impacted global HIV-control efforts, particularly in South Africa, which has had one of the greatest HIV epidemics in history, with an estimated 7.7 million PLHIV, and over 46% are not virally suppressed. With the focus shifting towards combating the new virus, many routine HIV services had to be side-lined or modified to accommodate the response to the pandemic. One of the immediate effects of the pandemic prolonged the disruption of HIV treatment and care services, particularly the HIV Anti-Retroviral Therapy (ART) programs. PLHIV often face challenges accessing medications and regular medical appointments due to prolonged lockdowns, Social distancing measures, and overwhelmed healthcare systems. As a result, there was a heightened risk of new HIV infections among vulnerable communities. This also created barriers to consistent adherence to ARV therapy and could have weakened the immune system, rendering PLHIV more susceptible to opportunistic infections and severe forms of COVID-19, which may eventually lead to death. Even though it seems evident that the COVID-19 pandemic had a detrimental effect on the immune status of PLHIV, this impact has been under-explored, and available studies are flooded with contradictions. Hence, the aim of the study was to assess the prevalence of abnormal CD4+ counts and HIV viral loads in PLHIV post-SARSCoV-2 infection by comparing pre-pandemic and post-pandemic results CD4+ counts, and HIV VL results were accessed from Gauteng's PathCare Vermaak laboratory database (skylims). Test results for up to 36 months before and after the first declaration of the pandemic on March 26, 2020, were extrapolated and analysed using SPSS. After controlling covariates such as age, gender, and TB status, 54% of PLHIV who had HIV VL <1000 copies/ml and CD4+ count of >500 cells/mm3 before COVID-19 infection maintained the same HIV prognostic marker levels during and after SARS-COV-2 infection. While 46% of PLHIV that had HIV VL >1000 copies/ml and CD4+ count of <200 cells/mm3 before COVID-19 had a significant increase in the HIV VL and a significant decrease in their CD4+ cells. PLHIV with <1000 copies/ml and CD4+ count of >500 cells/mm3 are affected the same way as PLWHIV, while PLHIV HIV VL >1000 copies/ml and CD4+ count of <200 cells/mm3 had the worse prognosis

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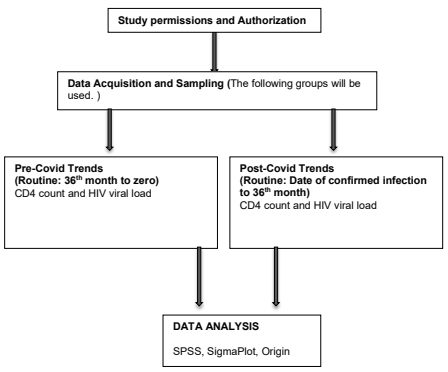
Graphical Abstract



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Spatio-temporal variations of Neonicotinoids in the Letaba River System (Limpopo Province, South Africa)

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Agricultural activities are one of the main contributors to the growth of the African economy, as it employs approximately 65% and provide important food sources 1. As the world population increases, the need for good quality food also increases. Neonicotinoids are systematic agricultural insecticides used globally as crop protection mechanism in the agricultural sector. These compounds selectively control pests, by binding strongly to nicotinic acetylcholine receptors in the central nervous system. However, studies evaluating the uptake of neonicotinoids by crops reported that less than 20% of the active ingredient is absorbed by the crop while <2% gets absorbed by dust and 80% gets absorbed by the soil. In addition, climatic conditions and the physicochemical characteristics of neonicotinoids result in their translocation from the original source into water bodies 2. This implies that they will persist in the environment 3. These compounds have also been demonstrated to pose adverse health effects on humans and organisms, with their toxicity leading to possible mortality 2. This study is aimed at evaluating the spatial and temporal distribution of neonicotinoids and their metabolites in water and sediment from the Letaba River Catchment and its tributaries. The study area is situated in the Limpopo Province, South Africa, in the vicinity of intense agricultural activities. Water and sediment samples were collected for low flow and high flow seasons and subjected to solid phase extraction (SPE) and microwave-assisted extraction (MAE), respectively. Targeted and non-target analysis was carried out by LC-QTOF and LC-MS 2-3. Water quality parameters were measured in-situ to evaluate seasonal variations, electrical conductivity was higher in winter compared to summer (ranged 123.9-1483 $\mu s/cm$), the opposite was observed for temperature which was higher in summer ranging between 20,9-31℃. Four neonicotinoids (acetamiprid, clothianidin, imidacloprid and thiamethoxam) detection ranged from 0,0000164- 0,0193888 ng/mL with acetamiprid being the most prevalent compound. Since it is one of the registered compounds that are allowed for use in South Africa, this implies that it is the most widely used neonicotinoid in Limpopo.

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Bioassay-guided evaluation of potential antimalarial activities from Ximenia caffra, Ziziphus mucronata and Ricinus communis

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Keywords: Antimalarial, Medicinal plants, Ziziphus mucronata

The increasing resistance of Plasmodium parasites to currently available antimalarial therapy poses a great challenge in the treatment of malaria. Plants have been used as a primary source of novel pharmacologically active compounds to make drugs since ancient times and more than 80% of the rural population relies on traditional medicine for their primary healthcare needs [1]. Therefore, this study aims to explore the antimalarial properties of three South African plants used in traditional medicine to treat malaria. The medicinal plants, Ximenia caffra, Ziziphus mucronata, and Ricinus communis claimed traditionally, to treat malaria, were explored for their antimalarial potentials through sequential extraction using hexane, ethyl acetate, dichloromethane, and methanol. Plant crude extracts were screened for asexual antiplasmodial activity using the SYBR Green I malaria assay on chloroquine-sensitive strain NF54 strain of P. falciparum parasites. Dichloromethane and ethyl acetate extracts of the bark of Z. mucronata displayed promising antimalarial activities with IC50 values of 5.494 µM and 7.227 µM, respectively. These were further subjected to column chromatography for the isolation of pure compound(s), which were later characterized to be Betulinic acid, methyl betulinate, and lupeol. In silico evaluation of the isolated compounds was conducted by molecular docking and further validated with in vitro experiments against a purified protein target, Plasmodium falciparum hypoxanthine-guanine-xanthine phosphoribosyltransferase (PfHGXPRT). Taken together, the antimalarial activity of the crude extracts and the isolated compounds confirm these medicinal plants could serve as effective agents for the treatment of malaria.

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A systematic review of the lived experiences of higher education students engagingin online proctored assessments in a developing country context

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Keywords: Proctoring, Online Assessments, Higher Education, Lived Experiences, Developing Countries

The COVID-19 pandemic led to Higher Education Institutions (HEI) transitioning to online learning, catching many countries off-guard. As a solution, proctored assessments ensured academic integrity. Numerous studies examined these online remote proctored assessments (ORAP) [1][2][3] from various angles. However, this research delved into students' experiences in developing countries using ORAP. A critical interpretive synthesis literature review guided by the Participation, Intervention, Comparison and Outcome (PICO) framework method [4]. The initial databank search protocol yielded 2375 from ProQuest; 197 from EBSCOhost and 10 from Scopus. Inclusion and exclusion criteria pertinent to the research focus areas were applied resulting in 11 pertinent articles that highlighted challenges like poor ICT infrastructure, limited device access, erratic electricity, HEI governance issues, and student stress. The findings suggest inadequate governance policies, causing students to view ORAP as unjust and unfair.

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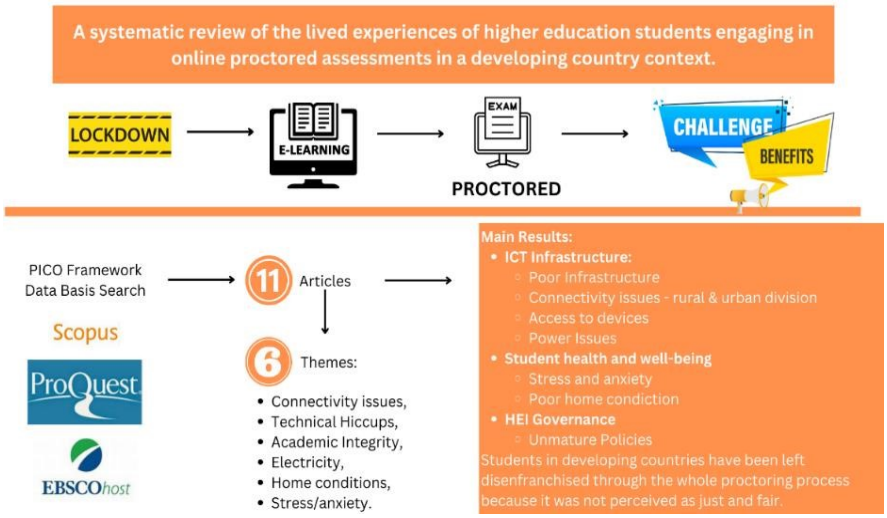
Graphical Abstract



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Evaluating the water reuse potential of greywater

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Keywords: Greywater, water scarcity, zeolitic imidazolate framework-8, membrane technology

Greywater is defined as wastewater generated in households from kitchen sinks, showers, laundry, hand washing, and cleaning floor [1]. This water has been highlighted as an effective means to supplement water shortages, for domestic use, like flushing toilets and irrigation to bridge the gap between water supply and water demand [1], [2]. However, greywater contains contaminants such as heavy metals and organic contaminants which includes surfactants, pharmaceuticals, cosmetics, and more. The consumption of crops irrigated by untreated greywater puts humans at risk of contradicting water borne illness such as gastroenteritis, dermal infection, and enteric fever [2]. This study aims to evaluate the reuse potential of greywater, following the application of reverse osmosis (RO) membrane technology, to remove pollutants. RO membrane technology for wastewater treatment have been found to produce high quality effluents due to their small pore size that affords the high pollutants rejection compared to biological and electrochemical treatment processes which are costly, high-energy consumption and uses chemical [3]. Cellulose acetate membrane will be incorporated with Amine functionalized zeolitic imidazolate framework-8 (NH2-ZIF-8) through interfacial polymerization to form the RO membrane and improve its performance . The Zeolitic imidazole framework-8 (ZIF-8) was synthesized and functionalized to form NH2-ZIF-8 nanoparticles via post-synthetic modification through ligand exchange of 2-methylimidazole (2-MIm) with 3-Amino-1,2,4-triazole (Atz). The successful synthesis of ZIF-8 and NH2-ZIF-8 nanoparticles were confirmed with SEM, TEM, XRD, FTIR and XPS. The functionalized nanoparticles size was found to be smaller compared to the pristine ZIF-8 which is expected to be beneficial in terms of large surface area leading to more active's sites on the membrane. Synthetic laundry greywater, including environmental samples will be assessed and benchmarked against irrigation standards, and ultimately drinking water standards, following its reclamation. ICPOES and GC-MS was used to for qualitative and quantitative analysis of the targeted and non-targeted contaminants before and after the treatment with RO membrane. The viability of the reclaimed water was determined using a seed germination test. The results will be used as baseline information to regulate greywater reuse and provide an effective method for analysis and contaminant removal for greywater irrigation.

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Removal of nickel from contaminated water using activated sugarcane bagasse and orange peels

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Environmental pollution caused by industrialisation, anthropogenic activities, and overuse of chemicals has led to the release of potentially toxic elements (PTEs) into the aquatic environment [1]. The presence of PTEs in the environment is a threat that needs to be addressed urgently because they are non-biodegradable and have high toxicity and mobility in the environment [2]. These PTEs, particularly Nickel (Ni), can accumulate in aquatic organisms such as fish, shellfish, and algae and finally be exposed to humans through the food chain. This can lead to various health problems, including cancer, neurological damage, and developmental disorders [3]. Technologies currently used to remove PTEs in wastewater are not cost-effective, and, in some cases, their utilisation leads to adverse health effects. This study was motivated by the need to evaluate the potential of low-cost and reusable biosorbents such as orange peels (OPs) and sugarcane bagasse (SCB) and their activated forms individually and in combination for removing Ni from simulated aqueous solution and wastewater. The results revealed that OPs could remove 87% of Ni(II) at an optimum contact time of 90 minutes, while SCB could remove 81% at an optimum contact time of 90 minutes. The pure and activated bio-sorbents were characterised using, Fourier-transform infrared (FTIR) spectroscopy, scanning electron microscopy (SEM) hyphenated to energy-dispersive spectroscopy (EDS), powder X-ray diffraction (PXRD) and thermogravimetric analysis (TGA). The characterisation results confirmed Ni(II) adsorption by the pure and activated OPs and SCB. From the findings of this study, the use of OPs and SCB, as well as their activated forms could potentially yield the desired result in Ni(II) removal from wastewater.

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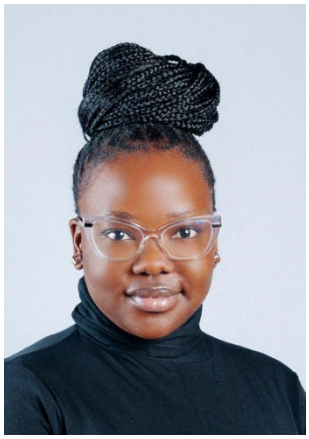

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Acknowledgements

Postgraduate School

Postgraduate Fund Management (PFM) unit – Head of Department: Mr Praveen Singh
Statistical Consultation Services (STATKON) unit - Head of Department: Dr Richard Devey
Policy, Benchmarking, Monitoring & Research (PBMR) unit – Specialist: Dr Vanishree Pillay

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Assessment Rubrics

Oral Category

Postgraduate Annual Conference
20 October 2023
Scoring Rubric
Oral Presentations - Category:

Name of Presenter: _____
Name of Judge: _____

Content						
	No	**Partly**	**Yes**	**Comments (If any)**	**Marks awarded**	**Possible points**
1. The title of the presentation is succinct & descriptive						5
2. Background and literature review: Adequate and relevant to the topic						10
3. Methods and analyses: Provide clear, concise description; ethical considerations were mentioned/discussed; and reference to ethical clearance numbers (if applicable)						10
4. Results: Clear presentation of most relevant results						10
5. Conclusions: Presents logical conclusion from the results						10
6. Implications: Puts study results into larger context						10
7. Academic Integrity: The relevant graphics and sources were cited as per faculty guidelines; and acknowledgement of financial support						5

Presentation						
1. Presentation is well structured: Clear and logical organization of the presentation						5
2. Presentation aids (slides etc.) enhance quality of presentation: Typography and design was efficient and consistent						5
3. Presentation is delivered in a professional & skillful manner						15
4. Q&A session is handled professionally & knowledgably						10
5. Efficient use of time and stays within allotted time						5
				Total		**100**

General feedback or words of encouragement:

Poster Category

PG & PDRF Annual Research Conference 2023
Poster Presentation – Judge Rubric

Competition Rules

- Postgraduate competition on a NQF 8, 9 and 10 Level
- Qualitative and Quantitative entries accepted
- Outcomes:
    - Students must be able to plan and present a scientific poster.
    - Students must be able to engage with the audience (panel members and guests) regarding questions that may be asked on the topic.
- Judging:
    - Qualitative and quantitative specific methods will be acknowledged
- Data analysis:
    - **Must be a student's own work and not done by a staff member**
    - Student(s) will be engaged on their knowledge of how the data was conducted, analysed and interpreted on the day
    - If computer software or STATKON services were employed, students must be able to explain how the analysis was done

Evaluation Process

- Harvard Referencing
- Design Elements
    - Researcher(s) information
    - Overall appeal (balanced composition, catchy)
    - Contribution of colours to understanding, not distracting
    - Font (size, style and quality)
    - Highlighting the major concepts
    - Short text segments
    - Legible pictures, figures and legends (size, font, contrast)
    - Effective use of space (concise, min 20% empty space)
    - Figures convey results effectively (simple, to point)
    - Reference List

Evaluation criteria:

Point 1

- How specific/adequate/long/short is the title?
- Can the author(s) be easily identified?
- Is contact information available (ie. Department/ University/Email)

Point 2

- Does the introduction include the research question, aim and objectives?
- Is it clear from the introduction section what the student is researching?

Point 3

- Does the provided literature add to the introduction in terms of credibilitly and validity (justification) of the research question?
- Does the literature review provide a theoretical orientation and reflect the level of current knowledge in this area?

Point 4

- How detailed, appropriate, original are the methods?
- Is there enough explanation?

Point 5

- How clear and well labelled are graphs, figures and illustrations?
- How well are the results presented?

Point 6

- Are any conclusions presented and if so do they reflect the aims and are they supported by the data?
- Is there a memorable “take-home” message?

Point 7

- How difficult is it to read the poster?
- How are colour schemes used, are they easy on the eye?
- How crowded is the poster?
- Is there a good flow of information (logical, layout of information)?
- Does the poster stimulate interest and discussion?
- Is the poster visually jumbled?
- How easy is it to follow the sequence in the poster?
- Is font size or style easily readable?
- How much text does the poster contain?
- Are there many grammar or spelling mistakes?

Point 8

- Points 2 and 3 deal with the research question and justification for it, can the student provide additional information?
- Are they able to justify their research by referring to more than what is provided on the poster? Can they elaborate on what is given in points 2 and 3?
- Was the content suitable for experts and non-experts alike?
- Was there sufficient scientific explanation, in terms of methodology and the study as a whole?

Point 9

- Did the student contribute to the body of scientific knowledge?
- Was an original contribution made to the scientific community – this is particularly important for PhD posters.

Point 10

- Presentation skills and quality of discussion.
- How much does the student's explanation demonstrate knowledge/ownership/ enthusiasm for the research?
- Was the student confident during their discussion
- Were they dressed appropriately? Business casual.
- Were they understandable? They spoke clearly and did not mumble
- They engaged with audience members – the panel members and guests.

Evaluation Form

Category name:

Name of Judge:

Name of Presenter:

Poster Number:

Poster Content					
Point 1 Title and Indentification	1	2	3	4	5
Point 2 Introduction	1	2	3	4	5
Point 3 Literature Review	1	2	3	4	5
Point 4 Methodology	1	2	3	4	5
Point 5 Results	1	2	3	4	5
Point 6 Conclusion	1	2	3	4	5
Point 7 Overall layout and readibility	1	2	3	4	5
Student Presentation					
Point 8 Justification and scientific content	1	2	3	4	5
Point 9 Contribution of the study?	1	2	3	4	5
Point 10 Presentation Skills	1	2	3	4	5
Total	……../50				

Thank you for making the Annual Postgraduate & Postdoctoral Research Conference a success in 2023.

We'll see you again in 2024 to celebrate the world-class research done at UJ!

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