MASINDE MULIRO UNIVERSITY OF SCIENCE AND TECHNOLOGY

4TH INTERNATIONAL STEMEIC VIRTUAL CONFERENCE, 2023

PROGRAM AND BOOK OF ABSTRACT

WEDNESDAY 15TH –FRIDAY 17TH NOVEMBER, 2023

THEME

"The Interface Between Digital Revolution and STEM: Navigating The New Frontiers"

Hon. Ezekiel Machogu
Cabinet Secretary for Education

Cabinet Secretary for Information Communication Technology- Hon. Eliud Owalo
The Vice Chancellor, Prof. Solomon Shibairo,
DVC (Planning, Research and Innovation), Prof. Charles Mutai,
DVC (Academic and Students Affairs), Prof. Hussein Golicha,
DVC (Administration and Finance), Prof. John Kuria Thuo,
Director of Research and Postgraduate Support, Prof. Francis Orata,
Chairperson of the Conference, Dr. Catherine Aurah
Invited Guest speakers,
Invited Guests,
Participants,
Ladies and Gentlemen,

Good morning!

It is with great pleasure that I join you all to the STEM Education International Conference 2023. I extend my heartfelt gratitude to the organizers for orchestrating this crucial event, and for selecting such a pertinent theme: 'The Interface between Digital Revolution and STEM: Navigating the New Frontier'.

Ladies and gentlemen,

The Ministry of Education is cognizant of the rapid advancements in digital technology which have significantly influenced the way we live and work. Introducing the interface between the digital revolution and STEM education is not merely a casual coincidence, but a vital confluence that demands our utmost attention. It gives us the opportunity to understand the relevance of incorporating digital literacy into traditional STEM subjects as we prepare our students for the demands of the modern world. Undoubtedly our world today is evolving at an extraordinary speed, driven by technological breakthroughs that are reshaping every aspect of our lives. As educators, policymakers, and stakeholders, we must recognize the urgent need to revise our educational frameworks to equip our learners with the skills and competencies necessary to thrive in this digitally dynamic age.

Ladies and gentlemen,

This year's conference theme is giving us the platform to deliberate, exchange ideas, and collaboratively envision a way forward with regard to the critical role of digital technology in shaping the future of STEM education. As we discuss the matter, I urge us, as the stakeholders to adopt these practices so as to meet the

demands of an increasingly interconnected and technologically advanced world. In doing this, we will foster a holistic and forward-looking approach to STEM education that nurtures innovation, adaptability, and inclusivity.

Ladies and gentlemen,

As we engage in the discussions over the next few days, I encourage each of you to actively participate, share your insights, and foster meaningful collaborations. Let us make use of every talent to craft a holistic and forward-looking blueprint for the integration of the digital revolution into STEM education. I assure you of my Ministry's support in these endeavours.

Through our collective efforts, we can pave the way for a future that not only embraces innovation but also nurtures a generation of informed, empowered, and compassionate global citizens.

I wish you all a productive and enriching experience at the STEM Education International Conference 2023. May our discussions be fruitful and our endeavours instrumental in shaping the future of STEM education worldwide.

And with this, I declare this conference officially opened.

Hon. Ezekiel Machogu
Cabinet Secretary, Ministry of Education

H.E. Hon. CS Eliud O. Owalo
Cabinet Secretary, Ministry of Information, Communications and The Digital Economy

The Chief Guest, Cabinet Secretary Education, Mr. Ezekiel Machogu,
The Principal Secretary State Department for Higher Education and Research Ministry of Education, Dr. Beatrice Inyangala,
The Chairperson of Council. Dr. Pamela Sitienei,
Members of the University Council,
The Vice Chancellor, Prof. Solomon Shibairo,
Deputy Vice Chancellors,
Organizers of this conference,
Researchers and Scholars,
Distinguished Guests,

Ladies and Gentlemen,

I am delighted to join you today during this 4th STEM Education International Conference themed 'The Interface between Digital Revolution and STEM: Navigating the New Frontier'. I wish to note that ICT is a critical component of the world's economies today, having permeated all sectors. The education sector is both a beneficiary of ICT and a major contributor to the development of ICT. Improving skills is a vital component of the ICT's growth strategy at the Ministry. In Kenya, we believe that our capacity to compete in the global market greatly depends on the ability of our people to innovate and apply the relevant technology for growth and development and STEM is part of this.

Ladies and Gentlemen,

Kenya has put innovation at the centre of its development strategy primarily through socio-economic blueprints as well as legislation. The Kenya vision 2030 has anchored ICT as the catalyst for achievement of socio-economic development. Indeed, education is identified as the means through which ICT skills are

developed and nurtured, thus creating a vital human resource to drive the national agenda. This is reinforced with the efforts to boost research and development that form the very core of innovation.

While ICT creates pressure for changes in education, it also provides the means for that very change. As society experiences the digitization of everything, learning methods and models change, thus offering educators and learners new digital tools such as virtual classrooms, personalised instruction, adaptive curriculum, and blended learning.

Ladies and Gentlemen,

You will all agree with me that it is only natural that students learn about the digital devices and systems they rely on, on a daily basis. With greater accessibility to affordable broadband internet, learners in STEM stand to benefit immensely through efficient communication, and access to digital learning resources.

We acknowledge that in Kenya, a lot has been achieved in terms of access to education, but we also note that we have more to do, particularly with regard to the quality and range of educational opportunities. For this reason, the government is harnessing the potential by ICT to address this challenge.

Ladies and Gentlemen,

As a Ministry, we are committed to promoting and creating economic opportunities as well as enhancing research and development through establishing the local assembly of digital devices spearheaded by our Universities and colleges. This is just a glimpse of the local scenario, which points to the potential that lies in boosting capacity as a step to help cope with the demand of the labour market.

There is need for greater collaboration between the education and ICT sector, and between government, academia and the private sector as well as other stakeholders to bridge the existing skills gaps. Universities and tertiary institutions in particular, should adapt to the needs of the sector, with due consideration for the fast pace of change.

And with this, I declare this conference officially closed

Mr. Eliud O. Owalo,
Cabinet Secretary, Ministry of Information, Communications and Digital Economy

Dr. Beatrice Muganda Inyangala
Principal Secretary, State Department of University Education and Research

The Cabinet Secretary for Education- Hon. Ezekiel Machogu,
Cabinet Secretary for Information Communication Technology- Hon. Eliud Owalo,
Chairperson of Council- Dr. Pamela Sitienei,
Vice Chancellor- Prof. Solomon Shibairo,
Guest Speakers,
Researchers,
Distinguished guests,

Ladies and Gentlemen!
It is my great pleasure to join you today on this auspicious occasion where we celebrate the remarkable strides made by our scholars in ensuring the transformation of education system in the higher institutions of learning. The fourth STEM Education International Conference 2023 (STEMEIC2023) themed, 'The Interface between Digital Revolution and STEM: Navigating the New Frontiers', resonates well with the current digital revolution in the wider array of expertise. The world around us is totally dependent on technology, making our lives easier. The innovation of digital infrastructure such as computers, desktops, laptops, data projectors, software programs, printers, scanners, and interactive teaching boxes have digitally served the purpose of learning today. It has not only helped us in learning but has also contributed to the key innovations in STEM.

Ladies and Gentlemen!

Let us collectively prioritize STEM skills and focus on enhancing STEM awareness and access. This will enable us to transform STEM education and navigate the new frontiers in the digital revolution. Further, collaboration and knowledge-sharing is paramount to accelerating STEM education and innovation.

Ladies and Gentlemen!

I urge the University Management to ensure that the curriculum is aligned with the changes and demands of the industry. Let us utilize modern teaching techniques, and invest in capacity building and professional development of all lecturers. Therefore, I urge you to create a culture that promotes the value of STEM to overcome enrolment barriers.

Let us ensure gender balance in this area by encouraging a good number of female students to pursue STEM programs. I am happy to note that MMUST is doing a commendable job as evidenced by the enrolment of students in this University. Further, the question of gender balance should stretch to the research component. Research teams should incorporate both genders to increase chances of funding.

Ladies and Gentlemen!

I acknowledge the notable steps taken by the Government of Kenya in enhancing the use of technology and for investing in Technical and Vocational Education and Training (TVET). I am reliably informed that MMUST has a fully-accredited TVET institute, and is training students using new technologies and ensuring that they are at par with the rigours of the industry. I encourage researchers to explore this area.

Ladies and Gentlemen!

The State Department for University Education and Research is committed to enhancing access, promote and coordinate the development of science and technology. We will provide the necessary support required in resource mobilization, career guidance, student support, as well as national and international partnership opportunities involving research. I urge you to liaise with us in order to tap into these opportunities for a better world.

Thank you and may God bless you!

Dr. Beatrice Muganda Inyangala,
Principal Secretary, State Department of University Education and Research

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Dr. Pamela Sitienei
Chairperson of Council, MMUST

The Chief Guest, Cabinet Secretary Education, Mr. Ezekiel Machogu,
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DVC (Administration and Finance), Prof. John Kuria Thuo,
Director of Research and Postgraduate Support, Prof. Francis Orata,
Chairperson of the Conference, Dr. Catherine Aurah
Invited Guest speakers,
Invited Guests,
Participants,

Ladies and Gentlemen,

Good morning!

I am pleased to be part of this Conference for the first time since its inception in 2020. I would like to begin by lauding Masinde Muliro University of Science and Technology for creating such a platform that brings

together national and international stakeholders. Indeed, this is indicative of the University Management's positive efforts towards promoting research and innovation in STEM, and related fields. I am cognizant that this annual event has placed MMUST on the global map, and enabled our researchers and scholars to spruce up their work while forming meaningful networks that will have an impact on our research agenda.

Ladies and Gentlemen,
The theme of this year's Conference could not be more timely as digital revolution has had a significant effect on teaching and learning. There is, therefore, an urgent need for institutions, particularly those of higher learning, to address and embrace this change, and see how best they can maximize on it to enhance the quality of education. I am glad to inform you that the MMUST Council has a plan to transform the activities of the University, including the digitalization of processes and services. Enhancing innovation and technology is also a big part of this plan. We are determined to ensure that students experience a conducive learning environment, which encourages them to express their creative ideas.

Ladies and Gentlemen,

MMUST is constantly reviewing its curriculum to include aspects of information technology, and some Schools have begun to explore the idea of incorporating Artificial Intelligence in teaching and learning. In addition, the University has kicked off plans to implement the Competency-Based Curriculum, in preparation to receive the first cohort of CBC students.

Ladies and Gentlemen,

I would like to take this opportunity to commend our women STEM ambassadors who have been doing a great job in championing girls' education in various parts of the region. I have had the privilege to work and travel around the world, and seen that empowering women and girls is key to transforming communities. I urge the ambassadors to continue in the same spirit so that the girl-child is fully empowered to navigate the world of technological advancement.

Ladies and Gentlemen,

The Government's new funding model requires that Universities have alternative income streams to facilitate their operations. Research can be an avenue of raising a substantial amount of funds to support teaching, learning and outreach. The MMUST Council is ready to support researchers who are willing to conduct cutting-edge research and innovation that will attract funding, which this University urgently needs. Council is committed to this fundraising endeavour.

Ladies and Gentlemen,

Once again, I would like to state that I am honoured to join you today in marking the 4th STEM Education International Conference. I wish you fruitful deliberations!

Dr. Pamela Sitienei
Chairperson of Council, MMUST

Prof. Solomon I. Shibairo
Vice Chancellor, MMUST

The Chief Guest, Cabinet Secretary Education, Mr. Ezekiel Machogu,
The Cabinet Secretary, ICT Mr. Eliud O. Owalo,
The Principal Secretary State Department for Higher Education and Research Ministry of Education, Dr. Beatrice Inyangala,
The Chairperson of Council. Dr. Pamela Sitienei,
Members of the University Council,
Vice Chancellors from various Universities
Deputy Vice Chancellors,
Conference Organizers
Researchers and Scholars,
Distinguished Guests,

Ladies and Gentlemen,

It is a great pleasure to welcome you all to Masinde Muliro University of Science and Technology and to the 4th STEM Education International Conference. This is certainly a unique platform for us to come together and shape the future of sustainable development.

Ladies and Gentlemen,

We are in an era in which advancements in technology are redefining what is possible, paving the way for more intuitive, efficient, and enjoyable user experiences. Technology is evolving at a breath-taking pace. I have no doubt, that these concerns are the premises on which the theme and sub-themes of this conference are anchored. This is the key driver of our conference themed: 'The Interface between Digital Revolution and STEM: Navigating the New Frontiers'. STEM is not just a collection of academic disciplines; it is the driving force behind innovation and progress.

Ladies and Gentlemen,

As you all may be aware, this conference focuses on harnessing scientific research, innovation and technology for sustainable development. It is a forum in which participants present papers, network for future collaborations, publish, socialize and find out what's new. In today's fast changing world, I want to

encourage you researchers and academicians to take advantage of such platforms to build synergies and collaborations that will attract funds to our institutions of Higher Education.
STEM education is more than just academic subjects; it's a way of thinking and approaching challenges. It encourages creativity, curiosity, and a lifelong love for learning. STEM education fosters the skills needed in today's job market, where technological advancements are transforming industries at an unprecedented pace.

Ladies and Gentlemen,

In a world marked by climate change, global health crises, and technological revolutions, STEM plays a crucial role. It equips us with requisite knowledge to address these challenges, find sustainable solutions, and improve the quality of life for all. STEM is not only about preparing the next generation for careers; it's about creating informed citizens who can make wise decisions in an increasingly dynamic world.
As we look to the future, let us recognize the importance of STEM education and its potential to shape a brighter, more sustainable world. Let's encourage young minds to embrace these fields, fostering a culture of innovation, inclusivity, and collaboration.

Ladies and Gentlemen,

Finally, I appreciate the support we have continued to receive from the Ministry of Education.
Thank you very much for accepting to grace this occasion. I thank all our key note speakers, our guest speakers and all participants present here today.
I recognize the efforts of the Division of Research, Planning and Innovation led by Prof. Charles Mutai and the conference organizing committee for working hard to ensure we have the 4th STEM Education International Conference hosted at MMUST. By supporting STEM education and embracing its principles, we invest in a future where Science, Technology, Engineering, and Mathematics lead us towards a world for all.

I wish you all a happy and successful conference.
Thank you, and God bless us all.

Prof. Solomon Shibairo

Vice Chancellor, MMUST

Prof. Charles Mutai
DVC, Planning, Research and Innovation

The Chief Guest, Cabinet Secretary Education, Mr. Ezekiel Machogu,
The Cabinet Secretary, ICT Mr. Eliud O. Owalo,
The Principal Secretary State Department for Higher Education and Research Ministry of Education, Dr. Beatrice Inyangala,
The Chairperson of Council. Dr. Pamela Sitienei,
Members of the University Council,
Vice Chancellors from various Universities
Vice Chancellor,
Conference Organizers
Researchers and Scholars,
Distinguished Guests,

Ladies and Gentlemen,

I am delighted to join you today for the 4th Stem Education International Conference (STEMEIC) themed 'The Interface between Digital Revolution and STEM: Navigating the New Frontier', which comes at a time when the Higher Education sector continues to embrace digital approaches in teaching and learning.

The Division of Planning, Research and Innovation is committed to ensuring that scholars come up with innovative ideas to accelerate the implementation of ICT and the teaching of STEM at all levels. We are cognizant of the fact that technology is the backbone of research in responding to the challenges facing education.

Ladies and gentlemen,

As a University, we provide innovative and creative leadership in research and innovation which also involves coordinating conferences as well as carrying out outreach programmes. Such

technology transfer creates and maintains collaborations for research that are necessary for community transformation. MMUST has had several successful conferences and registered several patents, utility models and ideas. Research activities have sharply increased due to funding offered to researchers by University Research Fund (URF). We have attracted and sustained excellent liaison and networking with media while at the same time increasing our Community Outreach engagements.

Through this conference, our researchers will gain an arsenal of skills in research that are transferable across the planet. As a University it is our obligation to offer long lasting solutions and contribute towards the digital revolution. This conference clearly sends a message that MMUST is ready to navigate the new frontiers in Science, ICT and Innovation.

I wish you fruitful deliberations!

Prof. Charles Mutai
Deputy Vice-Chancellor (Planning, Research and Innovation)

Prof. Francis Orata Omoto
Director, Research and Postgraduate Support

The Vice Chancellor, Prof. Solomon Shibairo,
DVC (Planning, Research and Innovation), Prof. Charles Mutai,
DVC (Academic and Students Affairs), Prof. Hussein Golicha,
DVC (Administration and Finance), Prof. John Kuria Thuo,
Chairperson of the Conference
Invited Guest speakers,
Invited Guests,
Participants,

Ladies and Gentlemen,

Good morning!

It is with great pleasure to welcome you all to MMUST in this 4TH STEM Education International Conference. This is a timely conference, that presents a truly unique platform for us to come together to discuss on how to navigate through the challenges and updates in teaching STEM. Being my first conference as a Director of Research and Postgraduate Support, I am honoured to interact with you and to address this forum.

Honourable CS, Ladies and Gentlemen,

We are in an era in which digital technology is first evolving, and affecting almost all aspects of our lives and careers. Progression in STEM education aided by digital technology has well been premised in the theme and sub-themes of this conference. Artificial intelligence, Smart Technologies, Technology and Innovation, Sustainable future, are some of the Key words that summarizes what we expect to hear from presenters during this conference. Of Importance is that we will be discussing the very frontier topics that well relate to the 21st century issues, such as Climate emergency, Blue and Green economy, and for Kenya, the much talked about Competence-Based Education (CBC).

Honorable CS, Ladies and Gentlemen,

MMUST through the Directorate of Research and Postgraduate Support has come up with Research themes that are meant to stir research, address the challenges aligned to the 17 Sustainable Development Goals (SGDs) as per the Division for Sustainable Development Goals (DSDG) in the United Nations. The Directorate recognizes the importance of multidisciplinary approach to research. The themes are also aligned to the Kenya Vision 2030 that aims to transform Kenya into a newly industrialized, middle-income country that provides high quality of life to all its citizens by 2030, in addition to other developmental goals.

Honourable CS, Ladies and Gentlemen,

Allow me to mention MMUST research themes, and welcome you to join us, as partners of the directorate, within the themes:

1. Environment, Climate Future safety and Sustainability
2. Leadership, Governance and policy
3. Trans-formative Education
4. Business environment, Economics and Management
5. Future and emerging technologies
6. Global Health
7. Biodiversity & Ecosystem Services
8. Human Development: Inclusivity, Gender and Diversity.
9. Advanced Materials
11. Indigenous knowledge culture and Communication
12. Agriculture, food and nutrition security
13. Digital Information and Computing Technologies

Just to inform you that this conference is among the three International conferences that MMUST will be holding within this year. We therefore invite you to other lined up conferences and officially welcome you to the Directorate of Research for collaborations and to establish networks with the university researchers in order to continually impart the world.

Thank you

Prof. Francis Orata Omoto
Director Research and Postgraduate Support.

Prof. Moses Poipoi
Dean, School of Education (Hosting School)

Dr. Catherine M. Aurah
Senior Lecturer, Department of Science and Mathematics Education,
STEMEIC2023 Chairperson

Ladies and gentlemen, distinguished guests, and respected colleagues,

May I take this golden chance to welcome you to the 4th STEM EDUCATION INTERNATIONAL CONFERENCE (STEMEIC2023), an inspiring gathering that celebrates the pivotal role of STEM (Science, Technology, Engineering, and Mathematics) in education. It is an absolute honour to stand before you as the chair of this prestigious international conference and extend my warmest greetings to each and every one of you. I am truly humbled to witness the participation of brilliant minds, innovators, and experts from diverse fields and nationalities, all brought together by a common passion for knowledge and progress.

The theme of this conference, ***"The Interface Between Digital Revolution and STEM: Navigating The New Frontiers"***, is a topic of utmost importance in our rapidly evolving world. It embodies the spirit of exploration and discovery. In an era marked by unprecedented technological advancements,

the synergy between the Digital Revolution and STEM (Science, Technology, Engineering, and Mathematics) fields is reshaping the way we live, work, and innovate.

The Digital Revolution, characterized by the rapid integration of digital technology into all aspects of human society, is fundamentally transforming the way we communicate, access information, and solve complex problems. Simultaneously, STEM disciplines are at the forefront of this revolution, driving innovation and paving the way for ground-breaking discoveries. The intersection of these two forces opens new frontiers of possibilities, but it also presents challenges that demand our attention and collaborative efforts. Over the next two days, we have the unique opportunity to engage in stimulating discussions, share ground-breaking research, and foster meaningful connections that have the potential to shape the future of our respective fields.

May we all actively participate, ask probing questions, engage in fruitful debates, learn from one another, challenge our own boundaries, and inspire each other to reach new heights of excellence. The richness of this conference lies in the diversity of perspectives and the depth of expertise present in this room.

On this note, allow me to pay special recognition to our young and upcoming scientists who are breaking the ceiling to share a platform with seasoned researchers. These are **six young girls** from Kaimosi Girls High School. Kudos. I truly appreciate teacher Kimakwa for nurturing these young scientists.

I would like to express my deepest gratitude to the organizing committee, the dedicated volunteers, and our generous sponsors ***(MMUST, Brandenburg University of Applied sciences, Germany; VYXER REMIT, and Oracle Academy)*** whose hard work and support have made this event possible. Their commitment to advancing knowledge and fostering collaboration is truly commendable.

I also want to extend my thanks to the keynote speakers, presenters, and attendees, who have purposed to be a part of this conference. Your contributions are invaluable, and I am confident that the insights shared here will have a lasting impact on our fields of study.

In conclusion, let us remain enthusiastic, curious, and with a spirit of mutual trust and friendship. May our interactions be fruitful, our discussions be enlightening, and our shared experiences be phenomenal. Together, we can create a legacy of knowledge that will inspire future generations of researchers and innovators. Together, we can pave the way for a brighter, more innovative tomorrow.

"YES WE CAN"

Thank you

Dr. Catherine Muhonja Aurah

Conference Chairperson

STEMEIC2023 KEYNOTE/GUEST SPEAKERS

Deepa Chari, PhD
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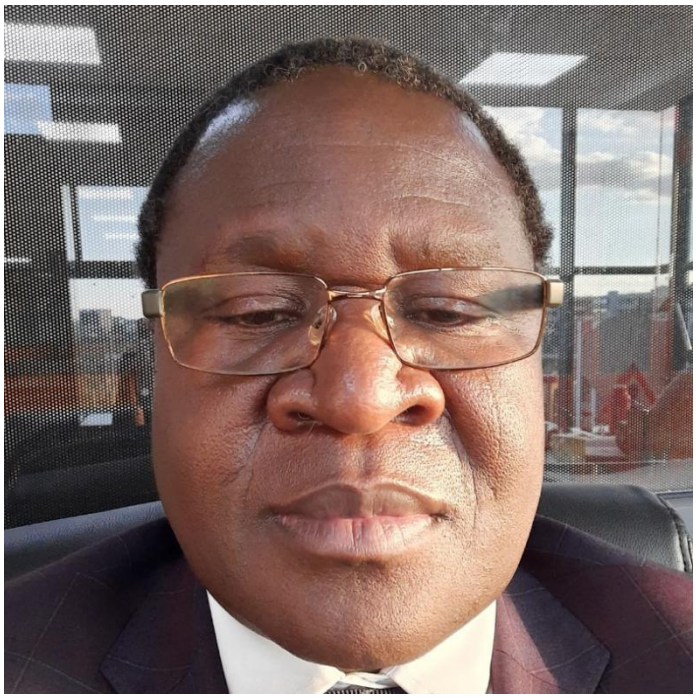
TOPIC: "Education Re-conceptualized: Implications for Pedagogy, Policy and Practice"

Deepa Chari is Reader at the Homi Bhabha Centre for Science Education (HBCSE), TIFR, India. At HBCSE, Deepa is actively contributing in many national and international diversity initiatives aimed at enhancing diversity representation in higher education, particularly in physics. She is also researching on how institutional practices can support science identity development.
Academically, Deepa earned her MS in medical physics and Ph.D. in physics education from the Dublin Institute of Technology, Ireland in 2014. Subsequent to PhD, she moved to the United States of America in 2015 for her postdoctoral research at the Physics Education Research Group of Kansas State University. There, she examined students' problem-solving practices in advanced physics courses. In 2016, she started working on the American Physical Society's "Bridge to Doctorate program". In this program, Deepa explored the trends in PhD admission practices of university physics departments and its effects on graduate diversity. Deepa, until 2019, worked as a postdoctoral research fellow at the STEM Transformation Institute of Florida International

University. She worked closely with university teachers on improving classroom environments for student-cantered learning.
Deepa joined HBCSE in September 2019. At HBCSE, she is the national coordinator of the Vigyan Pratibha program– a student nurture and teacher capacity-building program networking teachers from 80+ schools to access high-quality training and resources in science and mathematics. Deepa is a member of the organizing/ academic bodies of many institutional programs and actively talks about gendered issues in physics on various platforms. Her work has been published in journals like the American Journal of Physics, Physical Review Physics Education Research, European Journal of Physics, Journal of Engineering Education, and Journal of Qualitative Research Methods.



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TOPIC*: "Artificial Intelligence and the Future of STEM Disciplines".*

Dr-Eng. Oketch, is a Professional Engineer and Senior Consultant in Road Safety, Traffic Engineering, Transportation Planning and Modelling. Principal of TIMCON Associates consulting firm with offices in Toronto Canada and in the East African Region. He holds a Doctor of Philosophy, Transportation Engineering from Karlsruhe Institute of Technology (KIT), a Master of

Science, Transportation Engineering from Delft University of Technology and a Bachelor of Science, Civil Engineering from University of Nairobi.

Tom J. McConnell, Ph.D.
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TOPIC: "Bringing Digital Storytelling into the STEM Classroom: Shifting pedagogy to meet new ways of accessing and creating content"

Tom McConnell is a Professor of Science Education in the Department of Biology at Ball State University, Muncie, Indiana, USA. He has authored two book series about Project-Based Learning and environmental education, and he leads professional development programs for educator across the elementary and secondary grades. In 2022, he received the Immersive Learning Faculty Award at Ball State University, and he also is the recipient of the 2023-24 Excellence in Teaching Award from Ball State's Division of Strategic and Online Learning. He also serves as the managing editor for the *Global Institute for Transformative Education* and *The Hoosier Science Teacher*.

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TOPIC: 'Information technologies in STEM education in the 21st century.'

Lorna Juma is a driven and accomplished individual, graduating with First Class Honours in Business Information Technology and holding a certificate in Public Management from Texas Tech University. She furthered her education by earning an Enrichment Leadership certificate from Jackson State and is currently pursuing a Master's Degree in Project Planning and Management, demonstrating her commitment to continuous learning and professional growth.

With a profound passion for professional mentorship, Lorna focuses on empowering young girls interested in Engineering, Information Technology, and Computer Science. Recognizing the challenges women face in STEM careers, she actively provides guidance and support to aspiring individuals. Lorna leads an impactful program that encourages female students in High schools, Universities, Colleges, and TVETs to pursue rewarding STEM careers. Her vision for a more equitable and inclusive future drives her to inspire and unlock the full potential of aspiring women in STEM fields.

Dedicated to youth skills development, Lorna has actively contributed to various youth-driven initiatives, collaborating with organizations like KCB Foundation and projects funded by the United States African Development Foundation. As a Young African Leader under the Mandela Washington Fellowship, an initiative pioneered by President Barack Obama, Lorna Juma remains committed to driving positive change and creating opportunities for the next generation.

Prof. Rajgopal Sashti
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*TOPIC: "**Best Practices to Secure External Funding - "Research" and "program" grants and "fellowships."***

Beginning Fall 2015, Raj Sashti started his new role as Advisor, Fellowships and Sponsored Programs at the Sam Nunn School of International Affairs in the Ivan Allen College of Liberal Arts, Georgia Institute of Technology, Atlanta, Georgia - Georgia Tech. In terms of accomplishments, he was awarded a Fulbright Specialist Grant in Fall 2017 by the J. William Fulbright Board of Foreign Scholarships. In 2016, he joined the Roster of Fulbright Specialists as an academic and professional expert for period of five years (2016-2021) by the Institute of International Education's (IIE)/Council for the International Exchange of Scholars (CIES) and served on the peer review team for the Fulbright Program. Before joining Tech, Raj Sashti served as the Director of International Education, International Program Development and the Nine University and College International Studies Consortium of Georgia at Southern Polytechnic State University (2009 - 2015). A recipient of three Fulbright Scholarships (to Germany, Japan and Brazil), over the years, he has worked at Clayton State (2004 - 2008) and Columbus State (1990-2004) universities of the University System of Georgia as an Associate Professor of Geography and Director of Grants and Sponsored Programs. In addition, he was also employed at the American Embassy/ USAID and the University of Wisconsin College Year in India Program in New Delhi, India.

Sashti is the recipient of more than $5,000,000 in direct and matching grants from the United States Department of Education, the United States Department of State, the Institute for International Education and other non-profit organizations. During his 45 years of tenure in higher education, he has directed more than three dozen Fulbright programs funded faculty development projects in Europe; East, Southeast and South Asia; Africa; the Middle East; and Latin America; and other foreign language and international studies grants. His teaching and applied research interests include international education, training and development, and inter-linkages

between Western and non-Western societies. He has also served as an international education consultant to such well known schools as the University of Pittsburgh, California State University (Sacramento), North Carolina State University, the University of Tennessee, Wittenberg University (Springfield) and the University of Alaska (Fairbanks). He has received "Awards of Honour" to recognize his contributions to promote greater international understanding through educational and cultural exchange.

Prof. Eunice Ndirangu,
Dean, School of Nursing and Midwifery,
Aga Khan University, Kenya

TOPIC: "Improving healthcare access through digital health in Kenya".

Eunice Ndirangu-Mugo is a Professor and the Dean of the Aga Khan University School of Nursing and Midwifery, East Africa (AKU-SONAM EA). She is also the Chairperson of the Nursing Council of Kenya. Dr. Ndirangu holds a Bachelor of Science in Nursing (*summa cum laude)* from University of Eastern Africa – Baraton, Kenya; Master's in Advanced Nursing Practice and a PhD in Nursing Studies from the University of Nottingham in the United Kingdom.

Eunice's areas of expertise and interest are sociological aspects of HIV/AIDS prevention, care and support, health policy, mental wellbeing and resilience and nursing education. She has attended numerous conferences and published throughout the span of her academic career on a wide variety of topics. Eunice is dedicated to providing the best practice in higher education. Towards this end, she is an Associate Fellow of the Higher Education Academy in the UK and holds a Postgraduate Certificate of Teaching in Higher Education from Oxford Brookes University in the United Kingdom.

Eunice comes from a sub-Saharan country (Kenya) where nurses and midwives, who are on the front line of health care, are deeply committed, experienced, and skilled but lack the opportunities to obtain further education, training and mentorship driven by context-based evidence. In response to this, she is interested in the intersection between education and implementation science, generating cultural and social responsive evidence, and linking this to training, practice and research. In her current role as Dean and Professor in a School of Nursing & Midwifery, Eunice has endeavoured to lead projects geared towards mentorship and empowering nurses and midwives. In her role as the Chairperson of the Nursing Council of Kenya (a body that regulates nursing education and practice), she is involved in ensuring the all-important link between knowledge generation and translation, thus closing the theory-practice – policy gap. Further, she has spearheaded the development of critical policy and regulatory tools for nurses and midwives. Apart from her

current position, Eunice maintains roles as a reviewer for academic journals, as well as sitting on a number of committees and working groups at within and outside Aga Khan University. In view of her passion for women mentorship and empowerment, she sits on the board of One Girl Philanthropist.

Prof Kelvin K. Omieno, PhD
Associate Professor of Information Technology
Kaimosi Friends University

TOPIC: "Digital Literacy and Computational Thinking"

Prof. Kelvin K. Omieno is a holder of Bachelor of Science in Computer Science (First Class Honors) and Master of Science in Information Technology degrees from Masinde Muliro University of Science and Technology. He is also a holder of Master of Business Administration in Corporate Management from KCA University and Doctor of Philosophy in Business Information Systems from Jaramogi Oginga Odinga University of Science & Technology, Kenya. He is an Associate Professor of Information Technology at Kaimosi Friends University. Besides, Prof. Omieno poses Huawei Certified ICT Associate-Artificial Intelligence (HCIA-AI) and Certificate in Python Programming.

Prof. Omieno boasts of a wealth of administrative experience having served as a Founding and Current Dean, School of Computing and Information Technology (SCIT), Kaimosi Friends University (KAFU). He previously served as Chairman of Department of Computer Science in the Faculty of Science, Masinde Muliro University of Science and Technology (MMUST) and later as Founding Dean, School of Computing and Informatics, MMUST before leaving for KAFU. He is currently an Adjunct Professor in Department of Management Sciences and Academic Leader at Technical University of Mombasa (TUM). He is an External Examiner with Egerton University (EU) and Lukenya University (LU). Prof. Kelvin Omieno has served as a chairman and member in several other academic and non-academic appointments.

He has successfully supervised over 15 postgraduate students to completion including 8 Masters students and 7 PhDs and currently mentoring several other postgraduate and undergraduate students. He has over 30

publications in refereed journals. He has equally been involved in development of several academic programs besides being involved in research projects both as Team Leader and as co-researcher. He is a professional member of the Association for Computing Machinery (ACM), Internet Society (ISoC) and Association of Computing Practitioners-Kenya (ACPK).

Prof. Beatrice Akala
University of the Witwatersrand, Johannesburg
Akalabetty@gmail.com
Beatrice.akala@wits.ac.za

TOPIC: **"Gender inclusivity in STEM education: closing the gender gap for the 21st C skills and beyond"**

Dr. Beatrice M'mboga Akala is a Lecturer, University of the Witwatersrand, School of Education (WSoE) Johannesburg, South. Doctor Akala teaches in the department of Curriculum studies and Education studies division. She is also a Research Associate, Education and Curriculum Studies department, university of Johannesburg. She is currently coordinating a gender project in the SACHAIR [South African Research Chair in Teaching and Learning]. The gender project is investigating the experiences of Black and First Nation women doctoral studies in three countries- [South Africa, Kenya and Australia]. Dr. Akala was awarded a Post- Doctoral Research Fellowship [PDRF] at the Faculty of Education, department of Curriculum and Education studies [UJ] in 2016 upon completion of her PhD. Her illustrious teaching and scholarship career been undertaken several universities in South Africa. She has taught several undergraduate and post graduate courses at the University of the Witwatersrand (Wits) and at University of Johannesburg [UJ]. She has also taught a post graduate diploma course- School Leadership course in the Leadership and Management department at Pretoria university [UP].
Dr. Akala is a multidisciplinary scholar with scholarship interests in social justice, gender, education research and curriculum implementation policies. She has authored several journal articles in accredited journals, book chapters and blogs. She was part of ESRC-NRF SARiHE research project

as a local researcher. Dr. Akala writes for the Conversation, Africa Edition. She is an external examiner and a peer reviewer for several academic journals. She is affiliated with HELTASA- (The Higher Education Learning and Teaching Association of Southern Africa, ICET- (International Council on Education for Teaching), SOTL (Scholarship for Teaching and Learning) and SAWID (South African Women in Dialogue). She is an alumnus of the university of the Witwatersrand where she obtained her Doctor of Philosophy (PhD) and Master of
Education (Med) qualifications respectively. She holds a Bachelor of Education (Arts) from the University of Nairobi.

Her career highlights

2022: UNESCO Honoraria - The Right to Higher Education: Tracing good and emerging practices on the RTHE around the world Case study on the right to higher education, South Africa

2011: Keynote Address- Revisiting Education Reform in Kenya: A case of Competency Based Curriculum (CBC) -(4th Biennial EE4A), Naivasha, Kenya

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Prof. Maurice Vincent Ochilio Omolo (PhD)
Email: momolo@mmust.ac.ke, M.v.o.omolo@gmail.com

Presentation Title: *"Novel Bio-rational Product for Controlling the Jigger Flea Tunga Penetrants: A practical example of transiting from basic research findings to commercialization level."*

Sub theme: *Innovations in natural science and engineering: Bridging the gap between theory, practice and industry*

Prof Maurice Vincent Ochilo Omolo is a Professor of Organic Chemistry (**Natural Products)** at Masinde Muliro University of Science & Technology (MMUST), Kakamega, Kenya, where he has served in senior management positions as Director Quality Assurance (QA) and Director Science & Technology Park and Industrial Linkages for 12 years. Maurice received his Bachelor of Science, B.Sc. at Kenyatta University in 1998. Thereafter, he embarked on his postgraduate research at the International Centre of Insect Physiology & Ecology (ICIPE) and Kenyatta University, where he obtained his M.Sc. and PhD in Organic Chemistry in 2002 and 2005, respectively. His teaching and research career started in 2004 when he got employed as a lecturer at the Department of Physical Sciences, MMUST. From 2007 to 2010 he worked as a Post-Doctoral fellow in tsetse chemical ecology at the Behavioural and Chemical Ecology Department (BCED) at the International Centre for Insect Physiology & Ecology (ICIPE). In 2009, he got promoted to senior lecturer at the then newly created department of Pure & Applied Chemistry at MMUST. Four years later (2013) Maurice was promoted to Associate Professor of Organic Chemistry. In 2021 be got elevated to professor of Organic Chemistry. Prof. Omolo is a senior research professor with a wide range of experience in Patent Drafting, Chemical Ecology, Natural Products Research, volatile chemicals & Essential oils collections and chemistry and Semio-Chemistry of insects, particularly, the blood feeding insects from which together with Prof. Ahmed Hassanali & Prof. Isaiah Ndiege they got granted a US patent. He also has another three patents with KIPI and ARIPO for innovations in smokeless biomass cook stove and a pesticide for post-harvest pests of stored grains. In August 2020, he filed his 5th Patent on a formulation for killing the Jigger Flea, *Tunga penetrants*. Professor Omolo has won a number of research and innovation grants with the most current one from Bio-Innovate Africa on **commercialisation of bio-rational products for management of Tugiasis disease**. He has over 40 peer reviewed journal publications and developed a number of **Natural Products Supplements** including **Stingless bee honey varieties, Mauvin herbal tonic powder** and a **Detox** for wellness and wellbeing. Prof. Omolo is a member of the Kenya Chemical Society, the Natural Products Research Network Association for Eastern & Central Africa and an Alumni of German Academic Exchange Service (DAAD) where he received an award towards his PhD study. Lastly, Prof. Omolo is a trained and internationally recognized Facilitator & Master Facilitator of Virtues Project^{TM} International: A soft life skill international program that impacts positive discipline to any community.

Prof. Ngila Catherine
Executive Director, African Foundation for Women & Youth in Education & STI
Vice President for International Organization for Chemical Sciences in Development (IOCD)-Emerging Economies
Fmr. Ag. Executive Director, The African Academy of Sciences
Fellow of TWAS, AAS, & ASSAf
Visiting Prof., Analytical-Environmental Chemistry
University of Johannesburg
Email: jcngila2015@gmail.com

TOPIC: ***"Digital Revolution in STEM Education for the Marginalized: Is it a Panacea or a Toxin?"***.

Prof Jane Catherine Ngila is currently the Executive Director of the African Foundation for Women and Youth in Education, Science, Technology and Innovation (AFoWYESTI) (Jan 2023-) whose vision is to promote access to quality education, alleviate poverty and offer mentorship programmes for women and youth in STEM.

Prof Ngila is a Visiting Professor at University of Johannesburg. She was recently elected by International Organization for Chemical Sciences in Development as the Vice President for Emerging Economies (IOCD).

Prof Ngila is the immediate former Acting Executive Director of the African Academy of Sciences (AAS) where she was the chief executive officer.

Prof Ngila is a former Deputy Vice Chancellor of Riara University for Academic and Student Affairs (DVC-AA). She is also a former Deputy Director of the Institute of Oil and Gas (MIOG) under Kenya Pipeline Company, in charge of Training, Academic Programmes and Linkages. She was the Head of Applied Chemistry at University of Johannesburg, and also worked at the University of KwaZulu Natal, University of Botswana and Kenyatta University.

Prof Ngila is a Fellow of the World Academy of Sciences; Fellow of the Africa Academy of Sciences (AAS); Member of Academy of Science of South Africa (ASSAf); Member of the AAS Mentorship programme; was the Co-Chair for the 2021 Commonwealth Science Conference 22-26 Feb; Mentor of MasterCard Foundation Mentees; Member of various Chemical Societies (ACS, RSC, SACI) and Professional organizations.

Prof Ngila has won various Awards; 2021 L'Oréal-UNESCO for International Women in Science Awards for excellence in Water Research; 2017 African Union Kwame Nkrumah East Africa Regional Women Scientific Awards (January 2017); 2016 South Africa (SA) Distinguished Women in Science (WISA) Awards. She has received various Grants from South Africa National Research Foundation (NRF), Water Research Commission, and Council for Scientific for Industrial Research.

Prof Ngila's research work is in Analytical/ Environmental Chemistry and focuses on water quality/pollution monitoring; modelling methods of water treatment based on nanotechnology; development of analytical methodologies for detecting chemical substances in water. She has mentored over 100 Postgraduate students including 36 MSc, 34 PhDs, 18 Postdoctoral Fellows, 22 Honours and published over 500 publications comprising of over 260 journal articles, 15 book chapters, 18 conference proceedings, 60 Keynote/Invited Lectures and 165 Conference abstracts. She is rated by South Africa NRF with a Researchgate Score of 39.86 and h-Index 36; Google Scholar h-Index of 41 etc.

https://www.researchgate.net/profile/Jane_Ngila/
https://orcid.org/0000-0002-0121-4567
https://scholar.google.co.za/citations?user=NNc4NEYAAAAJ&hl=en
https://www.linkedin.com/in/catherine-ngila-68a620114

Dr. Ajwang Warria
Associate Professor, Faculty of Social Work
University of Calgary, Canada
Email: ajwang.waria@ucalgary.ca

TOPIC: **"Unpacking Health and Wellness in a Tech-Saturated World"**.

Ajwang' Warria (PhD) is an Associate Professor in the Faculty of Social Work at the University of Calgary (Canada). She previously served as a Senior Lecturer in the Department of Social Work at the University of the Witwatersrand (South Africa). Prior to joining academia, Dr. Warria worked in the counter-human trafficking field in southern Africa and practiced as a social worker with migrant children and their families and with street-connected children. She was the research lead for several projects funded by the South African government, USAID, UNICEF, Save the Children, CoRMSA etc.

In Canada, Dr. Warria is currently working in partnership with BRAVE Education and Immigrant Services Calgary with funding from Mitacs. The research projects are on the development of a Migration Knowledge Hub and a Trafficking Prevention Program. In addition, she is researching micro-finance and wellness in families in Kenya and counter-trafficking measures and interventions in South Africa.

Dr. Warria has published extensively in peer-reviewed journals and books. She is currently co-authoring a counter-trafficking book with transdisciplinary focus with academics from Canada, Cyprus and Australia. Her research interests are in transnational migration, child protection, international social work, and intervention research.

Dr. Edwin Kumfa
CEO STEMpower Inc.
Email: edwink@stempower.org
Tel: +251 94 192 3366

TOPIC: **"Unpacking Health and Wellness in a Tech-Saturated World"**.

Edwin Kumfa is the CEO of STEMpower Inc., a charity organization committed to strengthening STEM education in Africa. He is a Cameroonian from the Northwest Region of Cameroon but grew up in the capital city Yaoundé. He has always been inclined in the sciences from primary to tertiary education. As a trained Environmental and Resource Manager from the Brandenburg University of Technology Cottbus–Senftenberg–Germany, Edwin consulted as a Science Specialist and Expert in Environment and Climate change for over 4 years with UNESCO Liaison Office to the African Union and to the United Nations Economic Commission for Africa. He also worked with the International Institute for Capacity Building in Africa popularly known as UNESCO-IICBA for 2 years on Climate Change Education and Environmental related topics in Schools. Before joining STEMpower in 2021, he has been collaborating with STEMpower since 2016, during his days with UNESCO. He is fluent in English, French and German.

Prof. Emily Choge Kerama
Moi University
emily.choge@gmail.com

TOPIC: **"The Fourth-Dimension of Health: Spiritual Care in Health Settings- A Case of Moi Teaching and Referral Hospital"**.

THE CONFERENCE PROGRAMME

DAY ONE: WEDNESDAY, 15TH NOVEMBER 2023

TIME	ACTIVITY	RESPONSIBLE
Chair of Session: Prof. Francis Orata	**Rapporteur:** Dr. Teresa Okoth	
7.00-7.30AM	Log-in and Registration	Secretariat
	OFFICIAL OPENING OF THE CONFERENCE	
7.30-7.35AM	**WELCOMING REMARKS** **Dr. Catherine Aurah -**Chair STEMEIC 2023 **Prof. Francis Orata- Director research**	Dr. Catherine Aurah
7.35-7.45AM	**Prof. Charles Mutai** – Deputy Vice Chancellor (Planning, Research, and Innovation)	Prof. Francis Orata
	Prof. Hussein S. A. Golicha – Deputy Vice Chancellor (Academics & Students Affairs)	Prof. C. Mutai - DVC (PRI)
	Prof. John Kuria Thuo – Deputy Vice Chancellor (Administration & Finance)	
7.45-7.50AM	**OPENING REMARKS** **Prof. Solomon Shibairo**- Vice Chancellor, MMUST	Prof. C. Mutai - DVC (PRI)
7.50-7.55AM	**Dr. Pamela Sitienei**- Chairperson of Council, MMUST	Prof. Solomon Shibairo
7.55-8.05AM	**Dr. Beatrice Muganda Inyangala-**Principal Secretary, State Department of University Education and Research	Dr. Pamela Sitienei
8.05-8.30AM	**Mr. Eliud O. Owalo-** Cabinet Secretary, Ministry of Information, Communications and The Digital Economy	Dr. Beatrice Muganda Inyangala
8.30-9.00AM	**Hon. Ezekiel Machogu-** Cabinet Secretary for Education	
PLENARY SESSION **Moderator: Dr. Catherine Aurah**	**Rapporteur: Erick Wendo**	
9.00-10.00AM	**DR. DEEPA CHARI, PHD** **Reader** **Homo Bhabha Centre for Science Education** **Tata Institute of Fundamental Research** **V.N. Purav Marg, Mankhurd, Mumbai 400 088 India** **https://www.hbcse.tifr.res.in/people/academic/deepa-chari**	

	TOPIC: ***"Education Re-conceptualised: Implications for Pedagogy, Policy and Practice'***
	Group Virtual Photo/Break - DCCM

PRESENTATION SESSION	
Subtheme Eight: Education Re-conceptualised: Implications for Pedagogy , Policy and Practice **Moderator:** Dr Teresa Okoth **Rapporteur:** Mr. Cornelius Kwalia	
10.00-10.20AM	Service-Learning as a Lever to Support STEM Engagement and High Impact Practice for Higher Education Graduate Employability in Kenya **Rose Atieno Opiyo** **ropiyo@mmust.ac.ke**
10.20-10.40AM	Female students' Academic Achievement at Primary and Secondary School Levels 'Predicts' their Low Enrolment in STEM-Related Courses at University Level in Kenya. **Epari Ejakait, Paul Ogenga Akumu Geoffrey Ababu Musera &Ronald Werunga Kikechi** **eejakait@mmust.ac.ke, pogenga@mmust.ac.ke gmusera@mmust.ac.ke**
10.40-11.00AM	Student experiences with online platforms: Critical perspectives from Teaching and Learning of French as a Foreign Language (FFL) in Kenyan Universities **Rose Auma, Lydia Anyonje, Benard Mudogo,** **Joyce Kasili, Frida Miruka** **rauma@mmust.ac.ke, lanyonje@mmust.ac.ke, dmudogo@mmust.ac.ke,** **jkasili@mmust.ac.ke, fmiruka@mmust.ac.ke**
PLENARY SESSION **Moderator:** Dr. Paul Ogenga **Rapporteur:** Mr. Jairus Korir	
PRESENTATION SESSION **Sub-theme One:Information technologies in STEM education in the 21st century**	
DAY 1	**Moderator:** Dr Edwin Kanda **Rapporteur:** Ms. Ruth Songok
12.00-12.20PM	Future-Proofing Education: A Prototype for Simulating Oral Examinations with LLMs **André Nitze** **andre.nitze@th-brandenburg.de**
12.20-12.40PM	Development of a Circular Motion Concept Inventory for Use in Ugandan Science Education

	Kent Robert Kirya, Kalarattu Kandiyi Mashood, Lakhan Lal Yadav **kiryakirya038@gmail.com, mashoodkk123@gmail.com, yadavll@yahoo.com**
12.40-1.00PM	Sustainability and Innovation: The Intersection of Green Chemistry and the Digital Revolution - A Review **Octor Vitalice Ouma, Phillis Mutheu Mbinda** *octorvitalice@gmail.com, 123risecentury@gmail.com*
	PLENARY SESSION **Moderator:** Mr. John Arudo **Rapporteur: Mr. John Viane**
1.00-2.00PM	Prof. Eunice Ndirangu, Dean, School of Nursing and Midwifery, Aga Khan University, Kenya ***TOPIC: "Improving healthcare access through digital health in Kenya".***
	PRESENTATION SESSION ***Sub theme Four: Health and wellness in the technological era***
2.00-2.20PM	Predictors of Health-Related Quality of Life among Primary Caregivers of Cancer Patients in Kakamega County **Hellen Odeny, Tecla Sum, John Arudo** **hellenodeny@gmail.com, tsum@mmust.ac.ke, jarudo@mmust.ac.ke**
2.20-2.40PM	Management Outcome of Triaged and Coded Patients at Accident and Emergency Department of Kenyatta National Hospital, Kenya **Daniel Chelal, Tecla Sum, Everline Morema** *dchelal@gmail.com, tsum@mmust.ac.ke, emorema@mmust.ac.ke*
2.40-3.00PM	AbstractLymphedema Management Outcomes among Patients Treated for Breast Cancer at Selected Hospitals in Western Region of Kenya **Rosemary Wepukhulu, Damaris Ochanda, John Okoth** *waruinutracy@gmail.com, dochanda@mmust.ac.ke, jokoth@mmust.ac.ke*

PLENARY SESSION **Moderator:** Prof. Eng. B. Sabuni **Rapporteur:** Ms. Doreen Kawira	
3.00-4.00PM	**Dr. Eng. Timothy Oketch** Principal and Director, Transportation, Head Office: Toronto, Canada, Nairobi Office: 2B, Sifa Towers, Lenana Road, Kilimani, Nairobi, Kenya, Tel: +254 701-825-708 Cell: +254 718-138-932 Email: toketch@timcon-eng.com Web: www.timcon-eng.com ***TOPIC: "Artificial Intelligence and the Future of STEM Disciplines".***

DAY 1	**PRESENTATION SESSION**
4.00-4.20PM	Exploring AI Potential in Harnessing Blue and Green Economy for a Sustainable Future: A Review **Linda Yvonne Muyia, Kaleb Mwendwa Adamba** **lyndamuyia@gmail.com, kmwendwa@mmust.ac.ke**
4.20-4.40PM	Artificial Intelligence and Academic Publishing **David Barasa** **davidbarasa@mmust.ac.ke**
4.40-5.00PM	Robotic Swarm Application to Transmission Line Inspection and Maintenance Operations **Hudson Omuzi** **sir.omuzi@gmail.com**
	End of Day One

DAY TWO: THURSDAY, 16th NOVEMBER 2023

TIME	ACTIVITY	RESPONSIBLE
7.00-8.00AM	Log-in and Registration	Secretariat
	PLENARY SESSION **Moderator:** Dr. Ben Mudogo **Rapporteur: Ms.** Purity Muchere	
8.00-9.00AM	Prof. Beatrice Akala University of the Witwatersrand, Johannesburg Akalabetty@gmail.com, Beatrice.akala@wits.ac.za ***TOPIC: "Gender inclusivity in STEM education: closing the gender gap for the 21st C skills and beyond"***	
	PRESENTATION SESSION	
9.00-9.20AM	Efficacy of Pedagogical Strategies in Curriculum Implementation in Early Childhood Development Education in Kenya: Case Study of Hamisi Sub-County. **Herbert Obeywa Amunavi, Teresa A. Okoth-Oluoch, Rose Atieno Opiyo, Aggrey Mukasa Simiyu** **obeywaherbert@yahoo.com, tokoth@mmust.ac.ke, Atierose1973@gmail.com, simiyumukasa@yahoo.com**	
9.20-9.40AM	Effect of Enhanced Self – Learning Strategy On Students' Achievement In Biology **Adedamola Kareem** **damroj14@gmail.com**	
9.40-10.00AM	Effect of problem-based learning on students' problem-solving ability to learn physics in Ugandan secondary schools. **Nicholus Gumisirizah, Charles Magoba Muwonge, Joseph Nzabahimana** **ngumisirizah@gmail.com, charles_muwong2002@hotmail.co.uk, jeef.nzab@gmail.com**	
	PLENARY SESSION **Moderator: Prof. Moses Poipoi** **Rapporteur: Ms. Roselyn Abwalaba**	
10.00-11.00AM	**Ms. Lorna Juma** Programme Manager, SSA/EA Oracle Academy lorna.juma@oracle.com Phone: +254 729 091 143 | +254 20 288 9016 ***TOPIC: 'Information technologies in STEM education in the 21st century.'***	

	BREAKAWAY SESSION
	Moderator: Prof. Kennedy Bota **Rapporteur:Ms. Monica Odero**
11.00-11.20AM	Effect of Interactive Computer Simulations On Academic Performance and Learning Motivation in Physics **Gerard Tuyizere, Lakhan Lal Yadav** **gerasin2x@gmail.com, yadavll@yahoo.com**
11.20-11.40AM	Teachers Preparedness for Use of Computer Technology Tools in Teaching and Learning English Vocabulary in Grade Three in Primary Schools in Nyamira County, Kenya **Teresa Okoth** **tokoth@mmust.ac.ke**
11.40-12.00PM	On the predictors of pro-environmental behaviors: integrating personal values and the 2-MEV among secondary school students in Tanzania. **Catherine Aurah** **cmusalagani@mmust.ac.ke**
PLENARY SESSION **Moderator: Prof. Francis Orata** **Rapporteur: Ms. Josephine Nyamwange**	
12.00-1.00PM	**Prof. Vincent Maurice Omollo** Masinde Muliro University of Science and Technology, P. O. Box 190-50100 Kakamega www.mmust.ac.ke vomolo@mmust.ac.ke ***TOPIC: Novel Bio-rational Product for Controlling the Jigger Flea Tunga Penetrans: A practical example of transisting from basic research findings to commercialization level***
BREAKAWAY SESSION	
1.00-1.20PM	Evidence of Climate Change and Seasonal Agricultural Drought in Kakamega South Sub-County, Kakamega County, Kenya **Caroline Mulinya, Winnie Chelangat** ***cmulinya@kafu.ac.ke***
1.20-1.40PM	Mobile Applications Technology and Performance Of Agricultural Projects: A Case Of The Digifarm Sunflower Project In Makueni County, Kenya. **Juliet Jelimo Ronoh**

	chelimojuliette@gmail.com
1.40-2.00PM	
	PLENARY SESSION **Moderator: Dr. Rose Auma** **Rapporteur: Mr. Salmon Owidi**
2.00-3.00PM	**Prof. Emily Choge Kerama** Moi University Professor of Theology Chair, Post Graduate Departmental Committee; Department of Philosophy, Religion and Theology emily.choge@gmail.com ***TOPIC: "The Fourth-Dimension of Health: Spiritual Care in Health Settings- A Case of Moi Teaching and Referral Hospital".***
	PRESENTATION SESSION
DAY 2	
3.00-3.20PM	The Mathematics-Language Proficiency: The Learners Perspective **Vincent Otuma, Robert Kati** **nickotuma@gmail.com, rkati@kibu.ac.ke**
3.20-3.40PM	Enhancing students' achievement in biology using inquiry-based learning in Rwanda **Henriette Manishimwe, William Aino Shivoga, Venuste Nsengimana** ***mahenrie03@gmail.com, shivoga@gmail.com, Venusteok@gmail.com***
3.40-4.00PM	Are Collective Bargaining Agreements Compromising Equity In Grade Promotion Of Post-Primary Teachers In Extra-County And National Schools? A Comparison Between Scheme of Service aand Career Progression Guideline Approaches Of Implementation In Kenya **Livanze Miwani, Epari Ejakait, Paul Akumu Ogenga** ***ronaldlivanze@gmail.com, eejakait@mmust.ac.ke, pogenga@mmust.ac.ke***
PLENARY SESSION **Moderator: Mr. Ronald Michieka** **Rapporteur: Mr. Fredrick Mainda**	
4.00-5.00PM	Prof. Tom McConnell Ball State University 2000W.University Ave. Muncie, IN 47306 Tel: +(1) 765-289-1241 www.bsu.edu Cellphone: +(1) 765-760-1039 tjmcconnell@bsu.edu ***TOPIC: "Bringing Digital Storytelling into the STEM Classroom: Shifting pedagogy to meet new ways of accessing and creating content"***

	End of Day Two

DAY THREE: FRIDAY 17TH NOVEMBER 2023

TIME	ACTIVITY	RESPONSIBLE
7.00-8.00AM	Log-in and Registration	Secretariat
	PLENARY SESSION	
	Moderator: Dr. Edwin Kanda **Rapporteur: Ms. Aileen Sarange**	
8.00-9.00AM	**Dr. Ajwang' Waria** Associate Professor, Faculty of Social Work University of Calgary, Canada Email: ajwang.waria@ucalgary.ca ***TOPIC: "Unpacking Health and Wellness in a Tech-Saturated World".***	
9.00-10.00AM	KAIMOSI G.H. SCHOOL BUDDING SCIENTISTS: Gloria Gamba, Emmaculate Were, Eve Tolley, Nanvan Ayiro, Whitney Engefu, Army Lavine ***TOPIC: Recycling Plant Waste to Produce Liquid Fertilizer***	
	PRESENTATION SESSION	
Moderator: Mr. Kaleb Mwendwa **Rapporteur: Mr. Eric Wendo**		
10.00-10.20AM	Effects of Peer Mentorship on Academic Performance Among Bachelor of Science Nursing Students in Universities in Kenya **Ann Okanga, Damaris Ochanda, John Okoth** **asikokanga@yahoo.com, dochanda@mmust.ac.ke, jokoth@mmust.ac.ke**	
10.20-10.40AM	Observations and Lessons from The Pilot Implementation Of Universal Health Coverage With Reference to Machakos County and Its Implication On The Digitization Of Healthcare In Kenya **John M'Raiji** **jmraiji@mmust.ac.ke**	
	PLENARY SESSION	

	Moderator: Dr. Daniel Otanga **Rapporteur: Mr. Jairus Korir**
10.40- 11.40AM	Prof Kelvin K. Omieno, Ph.D Associate Professor of Information Technology Kaimosi Friends University P. O. Box 385-50309 KAIMOSI E: komieno@kafu.ac.ke Tel: +254 726 849197 ***TOPIC: Digital Literacy and Computational Thinking***
	BREAKAWAY SESSION
11.40- 12.00NOON	Detecting Change in Distribution using Modified (MIC) Energy Statistics **Joseph Njuki** *jnjuki@coastal.edu*
12.00- 12.20PM	Impact of explicit instruction on the Rwandan 11th grade physics student's views on Nature of Science **Jean Bosco Bugingo, Lakhan Lal Yadav, K. K Mashood** **bugingo2012@gmail.com, yadavll@yahoo.com**
12.20- 12.40PM	
12.40- 1.00PM	
	PLENARY
	Moderator: Dr. Opiyo Rose **Rapporteur: Prof. Alice Ndiema**
1.00-2.00PM	**Prof. Ngila, Catherine** Executive Director, African Foundation for Women & Youth in Education & STI P.O Box 22802-00400 Nairobi, Kenya Tel: +254 708 235 061 Email: jcngila2015@gmail.com https://womenandyouthfoundation.africa/ linkedin.com/in/women-and-youth-foundation-africa-018b54284 https://twitter.com/WomenandYouth_?s=20 Tel.: +254 708 235 061 ***TOPIC: "Digital Revolution in STEM Education for the marginalized: Is it a Panacea or a Toxin?".***
	BREAKAWAY SESSION

2.00-2.20PM	Potentials and limitations of GeoGebra in teaching and learning limits and continuity of functions at selected senior four Rwandan secondary schools **Jean Pierre Alpha Munyaruhengeri, Odette Umugiraneza, Jean Baptiste Ndagijimana, Theoneste Hakizimana** *jmunyaruhengeri2021@gmail.com*, *odetteumugiraneza7@gmail.com*, *htheoneste2000@yahoo.fr*
2.20-2.40PM	Information Technologies for STEM Education in the 21st Century **Esther Moraa[a]*, K. N. Bota[b],** **kbota@mmust.ac.ke, kbota83@hotmail.com**
2.40-3.00PM	Teaching The Unteachable in an Ever-Changing Landscape **Eunice Ndirangu** **Eunice.ndirangu@aku.edu**
	WORKSHOP **Moderator: Prof. Peter Bukhala Rapporteur: Ms. Monica Odero**
3.00-5.00PM	Prof. Rajgopal Sashti Director of Grants & Sponsored Programs/Advisor, Fellowships and Scholarships Columbus State University (**Retired**) University System of Georgia **Columbus/Atlanta, Georgia** **USA** Email: rsashti@yahoo.com ***TOPIC: "Best Practices to Secure External Funding -"Research" and "program" grants and "fellowships."***
	CLOSING CEREMONY
5.00-5.10PM	**Deputy Vice Chancellor, PRI**
5.10-5,20PM	**Vice Chancellor**
5.20-5.30PM	**NATIONAL ANTHEM AND PRAYER**
5.30PM	**DELEGATES DEPART AT THEIR OWN PLEASURE**
	End of Day Three
GOD BLESS US ALL ***SEE YOU IN YEAR 2024*** **KWAHERI/GOODBYE**	

ABSTRACTS

1. Bringing Digital Storytelling into the STEM Classroom: Shifting pedagogy to meet new ways of accessing and creating content.

Tom McConnell

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Abstract

Teaching in a STEM classroom has always presented opportunities to use technology in ways that differ from other subjects, but have we done all we can to evolve along with the ways our students use technology? What can we do with available technology that brings STEM learning to the learner using the tools they are most comfortable using? Asking questions like these leads us to consider if the text-based methods we often use for teaching may be failing to reach our intended audiences. The students in all our classrooms have grown up using portable devices to find the information they choose to consume. That information is usually in the format of short bits of text embedded in videos and images. The COVID-19 pandemic has forced us to face this reality, and it is now incumbent on us as educators to adapt to the modern way students use technology. Fortunately, STEM education presents many opportunities for educators to use the technology we carry in our pockets to create content that can be used to teach science, math and engineering concepts. In this presentation, Dr. McConnell will share efforts he has been exploring to create content for teaching that fits in a social media-sized chunk of information. Together, we can discuss some examples of using this new "digital storytelling" approach to present learners with the science phenomena that can engage them in STEM learning, and the possibilities of allowing students to show us what they know in a similar format for assessment.

Key Words: Digital storytelling; STEM pedagogy; information technology

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2. Teaching The Unteachable in an Ever-Changing Landscape

Eunice Ndirangu

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Abstract

I have an immense fascination with history and evolution. A story is told of a species known as the saber tooth cat that walked the earth centuries ago. The cat's characteristic appearance was two long fang like teeth hanging from the top jaw. The saber-shaped canine teeth which protruded from the mouth when closed alongside wide and bulky forearms, were well adopted to hunt and kill very large prey that was in existence at the time. With evolution, there was a decline in the prey population which led to the death and subsequent extinction of this cat. I equate this story to my practice of teaching and learning. Curricula and teaching strategies need to evolve continuously so that the graduates who go through our the various programs of

study are well adopted to current and future needs of the society. The strategies we use to provide care must all change in response to changing health needs. However, how do we teach that which is unteachable? How do we prepare graduates for a future that is uncertain? How do we teach learners who will perhaps have had more access to information than we can imagine? How do we deal with these questions in the age of technological explosion and fast changing digital landscape? There is perhaps no simple answer to these questions. Nonetheless, we must embrace innovative ways to facilitate deep learning and bring forth graduates who will be prepared beyond 'doing'. In my key note address I will seek to examine how we can interface digital revolution to educate graduates with the requisite tools to embrace innovative ways to increase access to health care in Kenya.

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3. Efficacy of Pedagogical Strategies in Curriculum Implementation in Early Childhood Development Education in Kenya: Case Study of Hamisi Sub-County.

Herbert Obeywa Amunavi,
Teresa A. Okoth-Oluoch,
Rose Atieno Opiyo, Aggrey Mukasa Simiyu

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Abstract

The purpose of this study was to assess the efficacy of Pedagogical strategies in ECDE curriculum implementation. The study objective was to assess the effectiveness of the pedagogical strategies in promoting learners' readiness for primary education. The study was guided by curriculum implementation theory by Gross (1971), Ecological Systems Theory of Bronfenbrenner revised by Guy Evans (2020) and Stufflebeam's CIPP evaluation model (2003).The study adopted a descriptive survey design .The study population comprised CSO's, Section Heads, ECDE centres-in-charge and teachers. A sample size of 212 respondents was calculated by Yamane's (1967) formula .Cluster, stratified and simple random sampling was used to apportion individual members of the groups. Data was collected using interview schedule, questionnaire, and Focus Group Discussions (FGD). Qualitative data was analysed using content analysis and presented in narrative form. Quantitative data was analysed using descriptive statistics such as frequencies and percentages and findings presented in pie charts, graphs and tables. Inferential statistics was done using parametric and non-parametric tests. Logistic regression analysis at 5% significance level was used to test the null hypothesis. Tests for normality by both Shapiro-Wilk and Kolmogorov-Sminorv tests was done on the data. P=0.042<0.05, hence we reject the null hypotheses that utilization of selected pedagogical strategies has no statistically significant effect on learners' readiness for primary education. These findings may be used by the County Government in designing,planning,funding to deliver quality ECD services.The National Government may use them in policy formulation and regulation to ensure effective supervision and management of centres to realize learners' readiness for school. Teachers may find these findings quite informative since it has provided various strategies on effective implementation of ECDE curriculum to enhance learners' preparedness for school.

Key Words: Pedagogical Strategies, Curriculum Implementation, Learner's preparedness

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4. Future-Proofing Education: A Prototype for Simulating Oral Examinations with LLMs

André Nitze

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Abstract

Background: The 21st-century STEM education landscape is rapidly transforming, with advanced information technologies, particularly Artificial Intelligence (AI) and Large Language Models (LLMs), playing a pivotal role in this evolution. As the educational sector grapples with the implications of AI-generated texts, oral examination conversations emerge as a direct and straightforward method for assessing students, ensuring genuine comprehension and knowledge application beyond generated content.Objectives: This research aims to explore the design, development, and potential impact of LLMs in higher education, with a particular emphasis on fostering an inclusive environment, bridging knowledge gaps, reducing the workload for educators, and enhancing the overall quality of teaching.

Methodology: A prototype, built upon the OpenAI API, was meticulously designed to simulate oral examination scenarios. This decision was grounded in the belief that real-time feedback and personalized learning pathways can greatly benefit from AI-driven systems. The prototype's development process, its features, and its user-interface design will be comprehensively outlined.

Results: The developed prototype demonstrated proficiency in simulating oral examination scenarios. It not only showed potential in offering personalized feedback but also in streamlining the preparation and evaluation process for educators, thus enhancing the efficiency of the examination procedure. Significantly, the prototype boasts high generalizability, necessitating minimal adaptations to accommodate diverse curricula. Conclusions: The devised prototype offers promising avenues for the democratization of STEM education through LLMs. Its capability to provide tailored learning experiences, combined with its adaptability across various educational contexts, accentuates its potential relevance in contemporary academic settings. Implications: As an educator, recognizing the prototype's value and its nascent stage is crucial. Its inherent generalizability offers a promising avenue for swift integration into diverse teaching settings. Collaborative efforts between developers and educators can further refine and ensure that future iterations remain aligned with pedagogical goals and uphold the highest educational standards.

Key Words: Artificial Intelligence, Large Language Models, Inclusive Education, Oral Examination Simulation, STEM Pedagogy

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5. Development of a Circular Motion Concept Inventory for Use in Ugandan Science Education

Kent Robert Kirya, Kalarattu Kandiyi Mashood,
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Abstract

In this study, circular motion concept items were presented and assessed with the goal of creating an inventory that was appropriate for the Ugandan setting. Ten undergraduate physics students and six physics professionals carried out the face and content assessment before administering the circular concept items. We investigated 42 circular motion concept tests that were administered to 118 physics undergrads. Educational measurement theories like the classical test theory (CTT) and item response curve (IRC) for triangulation were used to analyze the data. We determined the CTT's difficulty level, and discrimination index, and evaluated the effectiveness of the alternate responses' distractions. In addition, the IRCs offered information on circular items that was not obvious from the CTT's statistics. The circular concept items are categorized into three groups according to their IRCs: efficient, moderately efficient, and inefficient. The clustering of the items into categories offers empirical support for the selection of quality and suitable items for the population under consideration. The circular motion concept inventory (CMCI), which we have compiled comprises 22 circular motion concept items. This inventory is especially pertinent to the Ugandan context and might be helpful to other East African nations with comparable curricula. By comparing student scores between the pretest and posttest across instruction, the inventory may be used to assess students' conceptual progress and instructors' strategies. It can also be used to assess students' grasp of circular motion ideas.

Key Words: Physics Education Research, Concept Inventory, Circular Motion Concept Inventory (CMCI), Classical Test Theory (CTT), Item Response Curves (IRCs).

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6. Effect of Interactive Computer Simulations On Academic Performance And Learning Motivation In Physics

Gerard Tuyizere,
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Abstract

Innovative ways of teaching physics allow senior secondary students to become competitive as they provide them with necessary skills to afford various career pathways in engineering and other professional domains like mechanical engineering, construction engineering, information and communication technology and other related fields. Besides this, when physics is taught effectively to secondary students, it boosts their chance to becomes competent physicists who can develop theories and arrange experiments that help to understand natural phenomena and effectively manage the environment. However, for both teachers and students, physics course is seen as difficult when it comes to its teaching and learning. This study aimed at investigating the effect of interactive computer simulations on academic performance of physics students in terms of test scores and learning motivation. The investigation was done on students learning in Atomic Physics using Physics Education Technology (PhET) simulations. It used a quasi-experimental nonequivalent group design with a quantitative research approach. The participants were 163 senior five Rwandan secondary school students sampled through multistage sampling technique and assigned in two groups, a control group with 80 students, and an experimental group with 83 students. An Atomic Physics achievement test as pre/post-test and a questionnaire related to motivation were designed and examined for reliability and validity. Both descriptive and inferential statistics (t-test) were used for data presentation and analysis. On both test scores and learning motivation, the results showed that there were statistically significant differences between experimental and control groups in favor of experimental group. Based on the results of this research, it has been recommended that interactive computer simulations may be integrated and

operationalized in teaching and learning of physics in Rwanda. It was suggested that future researches may focus on teachers and students perceptions and attitudes towards the use of computer simulations in teaching and learning of STEM subjects.

Key Words: Atomic physics, Computer simulation, Conceptual understanding, Learning motivation.

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7. Evidence of Climate Change and Seasonal Agricultural Drought in Kakamega South Sub-County, Kakamega County, Kenya

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Abstract

Changes in climate have led to shifts in weather patterns outside the normal range of variation over a given time period attributed to either human action or natural causes. This as a result has led to reduced precipitation which consequently has resulted in reduced water availability for farming some seasons hence seasonal agricultural drought. This has greatly impacted smallholder farmers lowering their agricultural productivity. This study was undertaken in Kakamega South Sub-County in Kakamega County to determine the impact of seasonal agricultural drought. Discrete Choice Model and Capability Theory were used in this study. Both qualitative and quantitative research designs were used. Both Primary and secondary data sources were utilized, and they included questionnaires, interview schedules, Focused Group Discussions (FGDs), and field Secondary data sources including rainfall and temperature data collected from the meteorological station for a period of 35 years (1985-2020). Using Krejce and Morgan tables, a sample size of 377 households was obtained using simple random sampling from a target population of 26,940. Data was analyzed using Statistical Package of Social Sciences (SPSS v.23). The results of this study established that there was evidence of climate change and seasonal agricultural drought in Kakamega South sub-county as rainfall is positively correlated with humidity ($r=0.834$, $p< 0.05$). Humidity is negatively correlated with annual maize production ($r= -0.869$, $p< 0.05$) and annual average temperature ($r= -0.813$, $p< 0.05$). The study further recommended that in order to adapt to the effects of climate change that is a result of seasonal agricultural drought there was a need to improve the sustainability of crop production in the Kakamega South Sub-County by supplementing rain-fed farming with drip irrigation, rainwater gathering, and greenhouse techniques.

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8. The Cost of Kenya's Elections: Challenges that Election Violence pose on Gender Integration in Kibera Informal Settlement, Kenya

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Abstract

The National Cohesion and Integration Commission Act, no. 8 of 2008 postulates that social cohesion and integration provides an affective bond and feelings of solidarity between Kenyan citizens. However, Kenya's peaceful coexistence with each other is often disrupted by violent electoral processes which have been witnessed since the reintroduction of multiparty politics in 1992. To this extent Kenyans democratic right to choose their leaders come at a cost in form of challenges that election violence on gender integration. The main purpose of this study was to examine the challenges that election violence poses on gender integration in Kibera informal settlement in Kenya. The study was guided by both the frustration aggression theory as well as the social solidarity theory. The study employed the descriptive research design. Both proportionate stratified random and purposive sampling techniques were used to select a sample size of 609 respondents. A pilot study was carried out in Mathare informal settlement which was found to have the same characteristics as that of the study area. Of the 384 sampled respondents for quantitative study, 59.4% (228), said that election violence posed a challenge to gender integration, 26.6% (102) of the respondents said that election violence did not pose any challenge to gender integration and 14.1% (54), were not sure if election violence posed a challenge to gender integration. Ethnicity was found to pose the greatest challenge to gender integration during election violence. This was followed by political, social, economic and psycho-emotional challenges in a descending order. Ethnic challenges were identified as ethnic profiling, ethnic mistrust and stereo-typing along ethnic lines. Political challenges included; political intolerance and impunity, unfair political competition and political apathy whereas economic challenges constituted high unemployment rates particularly amongst the youthful population, low investment opportunities and lack of financial facilities and services. Social challenges were identified as social stratification especially along political and social class lines, poverty and lack of social support systems whereas psycho-emotional challenges were identified as fear, uncertainty, mistrust and hatred. The study concluded that election violence indeed posed a great challenge to gender integration. The study recommends strengthening of Kenya's independent bodies such as the IEBC, NCIC and courts to reduce political intolerance and impunity during elections, upscaling social support systems which are instrumental in enhancing gender integration during elections to deter negative ethnicity and increased investment and employment opportunities for Kenyans particularly the youths to mitigate economic challenges of the 21st Century.

Key Words: Election Cost, Challenges posed by election violence, Gender integration, Kibera informal settlement, Kenya

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9. Female students' Academic Achievement at Primary and Secondary School Levels 'Predicts' their Low Enrolment in STEM-Related Courses at University Level in Kenya.

Epari Ejakait, Paul Ogenga Akumu Geoffrey Ababu Musera &Ronald Werunga Kikechi

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Abstract

Background

Available statistics suggest a low uptake of Science Technology Engineering and Mathematics (STEM) programmes by female students at university level compared with their male counterparts. In 2016 for

instance, less than 15% of the students enrolled in universities in Kenya were studying STEM subjects. Out of these, just about 31.37% were female students enrolled in architecture, 22.27% in computing, 16.53% in engineering and 31.84% in math and statistics compared with 68.63%, 77.73%, 83.47% and 68.16% respectively for their male counterparts. As a result, there are policy proposals that aim at having at least 40% of enrolment in STEM programmes at the university being female[3].

Objective*The objective of this paper is to demonstrate that the low levels of enrolment in STEM-related programmes at university level for females can perhaps be traced to primary and secondary school levels*

Methodology *We use HLM on a dataset of 3550 students nested within 720 teachers nested within 120 schools, 30 each in Kirinyaga Central, Nandi South, Gem, and Tetu Sub-Counties and another from STEM intervention programmes in 23 model secondary schools in Rift Valley, Western and Nyanza regions of Kenya to compare scores between female and male students in STEM-related subjects in KCPE and KCSE examinations between 2015 and 2019.*

Results*Using HLM and multiple linear regression models, our results suggest that female students score 0.18 (p<.001) standard deviation units below their male counterparts in mathematics and 0.21 (p<.001) in science. Controlling for secondary school-level variables such as classification, location, teacher experience and qualification, multiple linear regression results suggest that female students comparatively score below their male counterparts in all STEM-related subjects for the five years under consideration. For instance, their academic scores in Physics for all the five years under consideration are lower compared with their male counterparts in 2015 by 60.57 (p=.003), 2016 by 62.85 (p=.014), 2017 by 50.50 (p=.016), 2018 by 74.96 (p=.039) and 2019 by 85.56 (p=.025).*

Policy Implications

Since Physics is the core subject for the engineering cluster of programmes at the university level, female students will continue to be 'excluded' from such programmes if their 'under achievement' in the subject continues unabated at secondary school level. The gridlock in their scores in physics, and indeed other STEM-related subjects needs partnerships at various levels for solutions.

Key words: STEM; Scores; Kenya

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10. Robotic Swarm Application to Transmission Line Inspection and Maintenance Operations

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Abstract

Human activities have led to the ever-growing need for sustainable energy from stable power systems. Therefore, regular inspection and preventive maintenance is necessary for uninterrupted power supply. Direct human involvement in inspection and maintenance operations has proved to be risky, costly, time consuming and inefficient. Application of robots in such operations reduces human vulnerability, guarantees accuracy, reliability, enhances efficiency and accessibility. Nevertheless, scrutiny of the current developments has shown that it is impossible to construct a robot that multi-tasks to fulfil various maintenance requirements, due to the bulk involved. This work seeks to accomplish varied tasks by applying the concept of robotic swarm, which spreads out

tasks to independent but well-coordinated robotic network. An appropriate control strategy for managing robot operations along transmission lines has been proposed. Ultimately, the design would increase the prospects of achieving autonomy.

Key Words: Robotic swarm, inspection, transmission line

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11. Predictors of Health-Related Quality of Life among Primary Caregivers of Cancer Patients in Kakamega County

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Abstract

Primary caregivers of cancer patients often suffer from impaired Health Related Quality of Life (HRQOL) due the responsibility of caregiving. This study sought to determine the factors predicting the Health-Related Quality of Life among primary care givers of cancer patients in Kakamega County. The sample size was 422 primary care givers of patients with cancer attending Kakamega General County Referral Hospital. Data collection tool was developed guided by WHOQoL-BREF QoL and PHQ9/GAD-7. Statistical Package for Social Sciences (SPSS) version 26 was used for data analysis. Findings showed that socio-economic factors such as marital status (P=0.043), residence (P=0.005), occupation (P=0.011) and income (P=0.027) were significantly associated with HRQoL. Patient related factors like mode of treatment (P=0.022) and type of test done (P=0.033) were significantly associated with HRQoL. Caregiver knowledge and family support related factors like seriousness of cancer as a disease(P=0.000), other family members offering help with care(P=0.004), other family members with cancer(P=0.038) and chronic illness(P=0.000) were significantly associated with HRQoL. Psychological related factors like depression (P=0.000), anxiety(P=0.017), perceived quality of life(P=0.000) and being satisfied with one's health (P=0.013) were significantly associated with HRQoL. The study concludes that socio-economic factors, psychological factors, patient factors and care givers knowledge on cancer were associated with health-related quality of life among caregivers of cancer patients. The study recommends that financial charges for cancer management be subsided to relieve the financial burden care givers are facing. Other family members should support primary care givers not only financially, but also psychologically to ease the burden of the primary care giver. Health care providers should create sometime to educate caregivers on various types of cancer their management, side effect of the drugs and how to assist their patients at home thereby easing the burden of cancer. Psychosocial support group networks should be established for caregivers through multiple communication channels thereby reducing the mental and psychological burden experienced by caregivers.

Key Words: Cancer care-givers, Primary care-givers, Health Related Quality of Life, Predictors

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12. Effects of Peer Mentorship on Academic Performance Among Bachelor of Science Nursing Students in Universities in Kenya

Ann Okanga, Damaris Ochanda,
John Okoth
asikokanga@yahoo.com, dochanda@mmust.ac.ke, jokoth@mmust.ac.ke

Abstract

Peer mentoring is one of the most effective interventions that have demonstrated ability to ease university transition and promote positive outcomes including better student performance. The study sought to examine the effects of peer mentorship on nursing student's academic performance in Kenya. The study was a pretest-posttest quasi-experimental design using quantitative means of data collection. It was conducted in 4 sampled Kenyan universities offering Bachelor of Science in Nursing that included University of East Africa Baraton, Uzima, Great Lakes University of Kisumu and Masinde Muliro University of Science and Technology. 50 third year students were trained and mentored 301 second years in 3 universities .1 university having 85 second year students served as a control group. Data was analysed using Statistical Package for the Social sciences version 28. Descriptive statistics were used to understand student distribution in universities. Paired-samples t-test and independent t test were used to establish relationship within and between groups. The clinical scores of experimental group compared with the control group indicated t=-7.5041, P .05 thus implying that the means of the two groups were significantly different. Results of classroom scores between the experimental and control groups were t=14.8713, P=.05, indicating statistical difference in the means. The pre and post results in clinical and class scores of experimental group indicated significant results with t=27.72, P=.05 and with t=18.01, P=.05 respectively. On the other hand, Pre and post results of clinical control and clinical experimental results indicated insignificant results of t=-0.60, P=.05 and t=0.96, P=.05 respectively. The study concluded that peer mentorship affects positively student academic performance and recommends use of peer mentorship to support students and inform policy.

Key Words: Peer mentoring, Academic performance, Nursing students, Universities

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13. Management Outcome of Triaged and Coded Patients at Accident and Emergency Department of Kenyatta National Hospital, Kenya

Authors

Abstract

The goal of triage is to prioritize patients who require the most urgent care and increase efficiency when resources are insufficient to treat all patients as per their degree or grade of injury. An effective and efficient emergency center triage system should be able to sort both trauma and non-trauma patients according to level of acuity. It also involves treatment as per the physiological parameters, either coded as red, orange, yellow, green or black. Kenyatta National Hospital has adopted the South African Triage Score (SATS) which has proven to be effective in monitoring the patients physiological parameters, it involves the use of a score form called triage early warning scores (TEWS). Several studies have found that emergency triage is an effective way to speed up the triage process, decrease waiting times, and boost patient outcomes in first-world nations. Low-income or limited-resource situations, on the other hand, present unique obstacles that might have a substantial effect on the selection and application of the most suitable triage scale and the success of its implementation. This study therefore evaluated the outcome of triaged and coded patients at accident and emergency department of Kenyatta National Hospital. Cross sectional research design was adopted with quantitative methods of data collection. A sample of 385 patients was used during this study, data collection was through structured questionnaires and checklist to assess the healthcare provider and institutional related factors. Data analysis included both descriptive and inferential statistics to test the association of the factors in relation to patient outcomes. The study results indicated that

patient related factors had significant influence on management outcome of triaged patients' (t-statistic=.210, p-value = 0.039 < 0.05). The other findings revealed that provider related factors had significant influence on management outcomes of patients triaged (t-statistic=13.055, p-value=0.002< 0.05). Further study results indicated that there was a positive and significant relationship between institutional related factors and management outcome of triaged patients'. This is depicted by a Pearson correlation coefficient r=0.452 p-value =0.008< 0.05 which was significant at 0.05 level of significance. This implies that improved institutional related factors result in an increase in management outcome of triaged patients. The study concludes that patients related factors; provider related factors and institutional related factors have an impact on the outcome of triaged and coded patients in accident and emergency department, Kenyatta national hospital. Thus it's important for the institution to invest in human resource capacity, procurement of equipment and drugs to be used as well as improve on infrastructure. Further research to be done to determine the patient satisfaction levels as well as the staff training needs assessment.

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14. Lymphedema Management Outcomes among Patients Treated for Breast Cancer at Selected Hospitals in Western Region Of Kenya

Authors

Abstract

Globally, 28% to 38% of breast cancer survivors develop lymphedema following breast treatment affecting one in five patients. Symptoms vary but include swelling, heaviness and pain, when severe; lymphedema significantly impacts the person's ability to perform tasks. Without treatment the condition progresses to serious complications such as necrosis and infection. In Sub-Saharan Africa reported comorbidities associated with lymphedema showed it is on the increase. Kenya has no data on the prevalence of lymphedema, although reports exist on different types of lymphedema treatment. In western Kenya, no studies have examined Lymphedema management outcomes. The aim of this study was to evaluate clinical management strategies for lymphedema secondary to breast cancer treatment. Specific objectives were to assess healthcare providers' competence in clinical management of lymphedema, to examine the effectiveness of strategies used in clinical management of lymphedema and determine lymphedema patient management outcome. Cross sectional analytical research design guided the conduct of the study. The study population included 192 health care providers working in the selected oncology centers in Western region of Kenya. Data collection was by a self-administered questionnaire, observation check list and focus group discussion and was analyzed using descriptive and inferential statistics. The results on knowledge among health care providers in important areas of lymphedema management including skin care showed OR = 0.56 and p = 0.01 and use of stocking class, A pressure (OR = 1.841, p = 0.004). Competent skills were demonstrated in history taking and assessment (OR; 1.6: CI: 1.0-2.4; p value =0.037). Bivariate analysis showed statistically significant results of patients developing lymphedema after single agent surgery (OR;0.1 CI 0.0-0.8 P Value =0.004) or combined

treatment Chemotherapy and Hormonal therapy (OR:0.5; CI;0.1-0.8, P Value =0.003). Borderline statistically significant results were also obtained from those on the combination of Surgery, Chemotherapy, Radiotherapy and Hormonal therapy OR; 0.5; CI: 0.1-0.4 P Value=0.065. The asymmetrical distributions showed some patients took several months to development lymphedema symptoms and used more than one treatment strategies; the highest proportion used prescribed exercise (58.8%) and medical treatment (59.4%). There was significant difference in response to each treatment and not all treatment strategies were effective. Patients on medical treatment were likely to report improvement with results showing (OR: 3.3; 95%CI: 1.6-6.5: P =0.005 and those on physical exercises (OR: 1.6; 95% CI: 1.1-3.2: P =0.032). In conclusion, healthcare providers demonstrated competence in patient assessment for lymphedema. Patients received combination management interventions with different responses and outcomes. The study recommends training opportunities to build capacity of healthcare providers on the use of different strategies for prevention and management of Lyphedema among patients following breats cancer treatment.

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15. Observations and Lessons from the Pilot Implementation Of Universal Health Coverage With Reference To Machakos County And Its Implication On the Digitization Of Healthcare In Kenya

Authors

Abstract

Universal Health Coverage (UHC) is among the key global initiatives adopted by the United Nations as a part of the Sustainable Development Goals and is an agenda entrenched in the World Health Organization's constitution. The global initiative aims to ensure that communities have access to health services without undue exposure to financial hardship. To implement this agenda, the United Nations General Assembly passed a resolution on 12th December 2012 urging member countries to prioritize access to affordable and quality healthcare cutting across curative, promotive, palliative, and rehabilitative health services with expected positive general well-being and socio-economic outcomes. The Government of Kenya, a member-state of the United Nations, thereto, has identified UHC as one of Her 'Big 4' Agendas and a key pillar to national development. Consequently, the Ministry of Health with the involvement of the National Hospital Insurance Fund (NHIF), the Kenya Medical Supplies Agency (KEMSA), and the Council of Governors (COG) initiated a pilot program that envisaged learning lessons that would aid a countrywide roll-out of UHC by 2022. Four counties were selected on the basis of varying social and health dynamics. Kisumu was selected for the prevalence of infectious diseases such as HIV and TB; Machakos owing to injuries arising from road accidents; Nyeri for non-communicable diseases such as diabetes; and Isiolo due to nomadism. The project was launched on the 13th December 2018. Against this background, this paper outlines the challenges, strategies, and interventions used by NHIF in conjunction with Pharm Access Kenya, a private consulting company; to sensitize and subsequently register members from the target population in Machakos County. The article highlights the successes and challenges

encountered in piloting the program and makes recommendations on key areas that need to be improved in up-scaling UHC in the entire country. In response to the COVID-19 pandemic, the research proposes several innovations, including digitization; that can serve as a valuable source of good practices for future policymaking in UHC.

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16. Effects of Peer Mentorship On Academic Performance Among Bachelor Of Science Nursing Students In Universities In Kenya

Abstract

Authors

Peer mentoring is one of the most effective interventions that have demonstrated ability to ease university transition and promote positive outcomes including better student performance. The study sought to examine the effects of peer mentorship on nursing students' academic performance in Kenya. The study was a pretest-posttest quasi-experimental design using quantitative means of data collection. It was conducted in 4 sampled Kenyan universities offering Bachelor of Science in Nursing that included University of East Africa Baraton, Uzima, Great Lakes University of Kisumu and Masinde Muliro University of Science and Technology. 50 third year students were trained and mentored 301 second years in 3 universities .1 university having 85 second year students served as a control group. Data was analysed using Statistical Package for the Social sciences version 28. Descriptive statistics were used to understand student distribution in universities. Paired-samples t-test and independent t test were used to establish relationship within and between groups. The clinical scores of experimental group compared with the control group indicated t=-7.5041, P≤ .05 thus implying that the means of the two groups were significantly different. Results of classroom scores between the experimental and control groups were t=14.8713, P≤.05, indicating statistical difference in the means. The pre and post results in clinical and class scores of experimental group indicated significant results with t=27.72, P=≤ .05 and with t=18.01, P=≤ .05 respectively. On the other hand, Pre and post results of clinical control and clinical experimental results indicated insignificant results of t=-0.60, P≥ .05 and t=0.96, P≥ .05 respectively. The study concluded that peer mentorship affects positively student academic performance and recommends use of peer mentorship to support students and inform policy.

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17. Recycling Plant Waste to Produce Liquid Fertilizer

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Abstract

Composting has become a preferable option to treat organic wastes to obtain a final stable sanitized product that can be used as an organic amendment. From home composting to big municipal waste treatment plants, composting is one of the few technologies that can be practically implemented at any scale. This review explores some of the essential issues in the field of composting/compost research: on one hand, the main parameters related to composting performance are compiled, with special emphasis on the maturity and stability of compost; on the other hand, the main rules of applying compost on crops and other applications are explored in detail, including all the effects that compost can have on agricultural land. Special attention is paid to aspects such as the improvement of the fertility of soils once compost is applied, the suppressor effect of compost and some negative experiences of massive compost application. We started our project four months ago, and we are making both solid and liquid fertilizer from chicken manure and plant waste including banana peels, orange peels, ugali, Sukuma wiki remains, cabbage remains. We collected the plant waste all over the school compound and even from the school dining hall. The school administration through the support from Green Growth Africa, made for us 10 collection bins located in specific areas in the school compound. Then we also modified 18 small collection bins to collect peels from classrooms. We collected the plant refuse, green matter chicken waste and mixed them in an area allocated to us in the school farm and allowed it to ferment for almost a month. We stored the other plant wastes and chicken refuse stored in containers with the purpose of extracting liquid fertilizer. We used the apparatus like the filtering equipment provided by the Green Growth Africa. The apparatus includes burettes, pipettes and retort stands for measuring exact volumes of the liquids we are producing.

Key Words: Recycling, Liquid Fertilizer

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18. Sustainability and Innovation: The Intersection of Green Chemistry and the Digital Revolution - A Review

Authors

Abstract

The convergence of the digital revolution and STEM disciplines has opened up exciting opportunities in the field of Green Chemistry. Since its birth (early 1990s), the green chemistry paradigm has reached an imperative status in the chemistry field; in this sense, many educational institutions and industries around the world have implemented the green chemistry principles to contribute to sustainable development goals. This review paper explores how digital technology, data analytics, and STEM advancements are being leveraged to drive innovations in sustainable chemistry. It also examines the role of interdisciplinary collaboration and discusses industry case studies, challenges, and future directions for the development of eco-friendly products and processes. Additionally, this paper addresses the importance of sustainability metrics, policy support, and education in promoting the intersection of Green Chemistry with the digital age. Although challenges persist, such as scaling up eco-friendly processes, sourcing sustainable feedstocks, and navigating complex regulatory landscapes, the

future of Green Chemistry looks promising. The paper envisions future where green materials, circular economy principles, and sustainable product design will play key roles in reshaping industries and mitigating environmental impacts.

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19. Exploring AI Potential in Harnessing Blue and Green Economy for a Sustainable Future: A Review

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Abstract

The concept of Blue Economy was first discussed by the United Nations at the UN Conference on Sustainable Development 2012 (Rio+20) (Doyle, 2018). Since then, it has emerged forcefully in Indian Ocean region discourse, and the discourse of many Indian Ocean region states. The blue economy integrates commercial, research and innovation activities across diverse industrial sectors and achieving a sustainable blue economy requires unlocking the potential of science and innovation to develop innovative ocean sustainability solutions. The BE concept, encompassing sectors such as fisheries, aquaculture, tourism, renewable energy, trade, transport, and biotechnology, emphasizes responsible resource utilization to foster economic growth while preserving marine ecosystem health. In this context, harnessing the Blue Economy is paramount, acknowledging the oceans' significant potential for sustainable development and advocating for inclusive, eco-conscious management practices that harmonize economic prosperity with environmental conservation. A green economy (GE) is defined as low carbon, resource efficient and socially inclusive. In a green economy, growth in employment and income are driven by public and private investment into such economic activities, infrastructure and assets that allow reduced carbon emissions and pollution, enhanced energy and resource efficiency, and prevention of the loss of biodiversity and ecosystem services. An Inclusive Green Economy (IGE) is a thriving economy that delivers the linked economic, social and environmental outcomes sought by the SDGs and the Paris Agreement. GE follows five key principles, each of which draws on important precedents in international policy and which together can guide economic reform in diverse contexts. The intersection of the Blue Economy and Green Economy represents a powerful synergy, as both paradigms share a common goal: achieving sustainable economic development while safeguarding the environment and promoting social equity. This intersection is not only harmonious but also essential for addressing the pressing challenges posed by climate change, environmental degradation, and economic inequality. AI plays a significant role in both the Blue Economy and the Green Economy; for example, in BE it plays a role in Ocean Exploration, Resource Management, Environmental Monitoring and Predictive Analytics while in Green Economy (GE) the critical roles are in Land Management, Smart Agriculture, Renewable Energy, Energy Efficiency, Green Buildings, Clean Transportation, Water management and Waste Management. AI fosters sustainable practices in the Blue and Green Economies, enhancing resource management, environmental protection, and efficiency. The synergy between these economies lies in the shared data, technology, and goals to create a more sustainable and resilient future.

Key words: AI, Blue Economy, Green Economy, Data, Sustainable Future

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20. Are Collective Bargaining Agreements Compromising Equity in Grade Promotion Of Post-Primary Teachers In Extra-County And National Schools? A Comparison Between Scheme Of Service And Career Progression Guideline Approaches Of Implementation In Kenya

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Abstract

The use of two different implementation approaches for the 2017-2021 Collective Bargaining Agreement of post-primary teachers casted doubts on equity in grade promotion because each union was affiliated to its own approach. Given that there were two unions at post-primary level, the purpose of this study was to compare equity accruable between them in Kakamega County. The objective was to determine the difference in equity between the use of scheme of service and the career progression guideline approaches based on Teacher Performance and Appraisal Development tool for 2017-2021. It was guided by a socialist economics of education theory. A comparative research design with a sample of 1,569 respondents from 5,923 was used. Systematic random sampling was used to select teachers in each union, purposive sampling for principals and saturated sampling for sub-county directors of education and union secretaries. The study enhanced content validity with internal consistency reliability of instruments at 0.877. In data analysis, gini permutation test found promotion to be marginally equitably allocated in Kenya Union of Post-Primary Education Teachers than in Kenya National Union of Teachers through 0.0567 and 0.0698 coefficients respectively. However, the pairwise correlation established plausible interactions between study variables at Î± = 0.05 with membership in Kenya Union of Post-Primary Education Teachers being statistically insignificant to promotion (pËƒ.05). The logistic regression analysis found a statistically significant difference (pâ‰¤.05) between the two unions with an extra TPAD score in 2017, and teaching in extra-county and national schools reducing the odds of promotion to the next grade.

Key Words: Equity; Grade Promotion; Collective Bargaining Agreement; Trade Union; Scheme of Service; Career Progression Guidelines; Teacher Performance and Appraisal Development

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21. Student experiences with online platforms: Critical perspectives from Teaching and Learning of French as a Foreign Language (FFL) in Kenyan Universities

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Abstract

Limited empirical evidence is available in the context of teaching and learning of French as a Foreign Language (FFL) as to whether the online platforms meet the needs of the learners. We seek to establish the needs experiences of university students during the online teaching and learning of French as a foreign

language (FFL) in sub-Saharan Africa, with specific focus on the Kenyan context. The results are based on three constructs; instructional materials, student support services and lecturers€™ preparedness. A survey questionnaire was administered to 81 students in their third and final years of study in three universities in Western Kenya. The results demonstrate that students do not feel that the available online pedagogical practices meet their language competencies in learning FFL. Language policy makers must consider such results alongside local implementation resistance in implementing FFL online learning programs.

Key Words: French as a Foreign Language; online programs; learners' needs; Universities; language policy

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22. Impact of explicit instruction on the Rwandan 11th grade physics students views on Nature of Science

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Abstract

The sample size of this study consisted of 148 students from 11th grade studying physics-chemistry-biology combination. The sample size was selected from two districts in which one day and one boarding school for each district were involved in this study. The intact classes were randomly assigned. Both quantitative and qualitative data were collected using the main questionnaire which was made up of close-ended and open-ended questions. To measure the change and impact of the intervention which lasted about six weeks, students views on NOS before the intervention were compared with the students views after the intervention. Frequency, mean, standard deviation, normalized gain and direct quotations from students were used during analysis. The results found that after the intervention, there was a significant change in students views towards all targeted NOS aspects. For example, mean score for tentative nature was changed from 2.27 (before) to 3.91 (after); the students views on empirical nature varied from 2.21 to 3.41; observation and inferences varied from 2.51 to 3.87; the students' views on laws and theories shifted from 2.20 to 3.35; creativity and imagination mean score changed from 2.53 to 3.92; social and cultural nature of science mean score changed from 2.45 to 3.90 and for scientific methods aspects, the mean score changed from 2.22 to 3.50. The findings also revealed that the impact of the intervention for all targeted NOS aspects was large and the gain ranged from 0.5 and above. Furthermore, the results indicate that gender, school status, and school location do not influence the students' views on NOS.

Key Words: Nature of Science (NOS); Explicit instruction; Physics students' views; Grade-11 students in Rwanda.

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23. On the predictors of pro-environmental behaviors: integrating personal values and the 2-MEV among secondary school students in Tanzania.

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Abstract

The role of personal values in understanding pro-environmental attitudes and behaviors has received considerable attention from psychological researchers. However, little is known about the mutual interaction of personal values and the Theory of Ecological Attitudes (2-MEV) in explaining pro-environmental behaviors (PEBs). To explore the mediating factors with which pro-environmental behaviors are explained via environmental attitudes and personal values, this article reports the study findings from secondary school students. Specifically, the article indicates the extent to which a unified model of personal values and the Theory of Ecological Attitudes (2-MEV) explain self-reported PEBs. The cross-cultural validity of the 2-MEV for measuring environmental attitudes (EA) among the selected respondents is as well investigated. A cross-sectional survey of 408 secondary school students was used for data collection. As expected, principal component analysis with a varimax rotation confirmed the two-factor structure of the 2-MEV measuring EA with two uncorrelated factors of Preservation and Utilization. Interestingly, multiple regression analyses indicated that a combined model of personal values and the 2-MEV provides a more explained variance of self-reported PEBs compared to when any of the two predicators is used independently. Overall, altruistic value provides the largest predictive power over egoistic and biospheric values in mediating EA. In turn, the general model that includes personal values and the 2-MEV indicates that Preservation makes the largest and unique contribution in explaining recycling, biodiversity protection, environmental activism, and general PEBs. Conversely, the Utilization factor provides the largest negative explained variance for management of environmental pollution behavior. These findings remain unaltered even when the age of respondents and social desirability responding are statistically controlled. The implications regarding these study findings are discussed.

Key Words: environmental attitudes, personal values, pro-environmental behaviour

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24. Artificial Intelligence and Academic Publishing

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Abstract

The recent advances in Artificial Intelligence (AI), together with increasing accessibility and ease of use, has had major impact on academic activities, including academic publishing. Some of the AI functions in academic publishing include statistical analysis. Where, one can input data into an AI and ask it to perform a statistical analysis. This is a process that would take hours with traditional technologies such as Statistical Package for Social Sciences. In this study, I aver that while the implementation of AI in publishing may serve to produce valuable content or perform tasks deemed too laborious and costly for humans, when left to its own devices it can also create content full of misinformation and potentially harm the academic publishing industry. The evidence and analysis for this study relied on extensive secondary evidence gathered over the period July 2023 to September 2023. The secondary evidence was compiled through an in-depth literature

review covering AI use cases and the relevant issues concerning AI in the publishing industry. The study concludes that, the use of AI in academic publishing will lead to proliferation of low quality or plagiarised manuscripts.

Key Words: Artificial Intelligence, Academic Publishing, ChatGPT

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25. Service-Learning as a Lever to Support STEM Engagement and High Impact Practice for Higher Education Graduate Employability in Kenya

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Abstract

In Kenya, universities have been criticised for overemphasizing on technical and instrumental outcome at the expense of what is believed to be key add-ons for STEM workforce entry. This has since undermined STEM graduates sense of humanity, critical consciousness, civic agency and stifled development of key employability skills they need. In most universities STEM faculties do not privilege highly engaging community-based approaches to STEM learning. For instance, in MMUST, little is known about service-learning (SL) as a lever to Support STEM engagement and high impact real world practice. Using a capability approach (CA) by Amartya Sen and Martha Nussbaum, this paper presents samples of service-learning programmes in STEM based Universities around the world. Relatedly, this paper analyses faculty and students long standing expectations, roles and benefits of SL approach to universities and corporate partners. Finally, this paper provides a portrait of a strong service-learning program, types of partnerships needed, samples of projects and its potential benefits in fostering STEM students engagement and high Impact STEM practice. This paper recommends an analysis and redesign of STEM course contents, instructional and assessment approaches for effective service learning. Administratively, effective partnership, financing, coordination, documentation of best practices and evaluation of service-learning projects is emphasized. The paper contributes to the understanding of SL as a concept of teaching and learning that fosters critical social values, fulfils university historic mission, and reinforces concepts woven throughout universities strategic plans.

Key words: Service- Learning, Science, Technology, Engineering and Mathematics (STEM), Higher Education, Kenya

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26. Teachers Preparedness for Use of Computer Technology Tools in Teaching and Learning English Vocabulary in Grade Three in Primary Schools in Nyamira County, Kenya

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Abstract

The use of computer technology has become an integral part of the teaching and learning process of English as a Second Language (ESL). This paper therefore seeks to assess teachersâ€™ preparedness for use of computer technology tools in teaching and learning English vocabulary in grade three in primary schools in Nyamira County, Kenya. The study adopted mixed methods research design and used stratified simple random and purposive sampling techniques to select a sample of 62 teachers and 23 Curriculum Support Officers (CSOs). Questionnaire for teachers and interview schedules for CSOs were used as instruments for data collection. The data collected included both qualitative and quantitative data. Qualitative data was categorised into themes and analysed using narrative technique. Quantitative data was analysed using descriptive statistics involving use of frequencies and percentages. The findings of the study revealed that majority of the teachers lacked adequate competence in the use of computer technology tools in English vocabulary teaching and learning activities. We therefore recommend that teachers should regularly update their knowledge and skills in the use of technology for optimal utilisation of computer technology tools in English vocabulary lessons.

Key Words: Teachers Preparedness, Computer Technology Tools, Teaching and Learning English Vocabulary

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27. Information Technologies for STEM Education in the 21st Century

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Abstract

There is a paradigm shift in the contemporary education for curricula to emphasize on STEM subjects. One way to make STEM education more impactful and beneficial to learners is through the use of information technologies. Using the narrative review method, this paper reveals that information technologies play a fundamental role by enabling the creation of real or authentic environment for teaching and learning, supporting content creation and collaborative learning, and supporting inquiry-based learning. It recommends that there is need for instructors/teachers, researchers, information technology experts and governments at national, regional and international level to work together towards streamlining and effective and efficient IT-supported STEM education.

Keywords: STEM education, information technologies, integration

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28. Social support and academic achievement of learners with cognitive difficulties in Kakamega County, Kenya

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Abstract

Cognitive difficulties encompass a wide range of learning problems. Time takers are generally considered to have cognitive difficulties. Occasionally, they are subject to neglect and derision from teachers, parents and peers. Teachers view them as 'dangerous' others because they slow down the pace of syllabus coverage, lower the class and school mean score. Ultimately some are hurdled out of initial schools. Some parents develop negative attitudes, with some withholding material and moral support in preference for their above average siblings. Furthermore, it has been observed that some classmates mock the time takers and ridicule their personal efforts. Even though inclusive education advocates for the accommodation of learners with special needs in regular classroom evidently the question social support is still a hurdle. Social support is a vital component in entrenching inclusive education and cultivating the desired social and academic achievement in all learners and particularly those with cognitive difficulties. The article highlights the fact that peer, parent and teacher support are essential. However, the influence of teachers is greater compared to that of peers and parents.

Key words: Cognitive difficulties, time takers, Support, regular classroom

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29. Effect of Enhanced Self – Learning Strategy On Students' Achievement In Biology

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Abstract

The study examined the effect of enhanced self-learning strategy on secondary school students achievement in Biology. Pre-test posttest quasi experimental research design was used for the study. Two co-educational secondary schools from Educational District II of Lagos State, Nigeria were purposively selected for the study. One intact Senior Secondary School II (SSS II) science class was randomly selected in each school for the study. Schools were randomly assigned into experimental and control group. In all, 193 students participated in the study. The instrument used for collection of data for the study were Self-Directed Learning Instructional Guide (ESDLIG) (r = 0.75), Conventional Teaching Instructional Guide (CTIG) (r = 0.72), and Biology Achievement Test (BAT) (r = 0.87). Two research questions and two hypotheses were raised and tested respectively. Data collected were analysed using descriptive and inferential statistics (ANCOVA). Findings revealed that students exposed to enhanced self-directed learning strategy performed higher than their counterparts that were exposed to conventional teaching strategy. Based on the findings, it was recommended that teachers should encourage students to learn biology with enhanced self-directed learning, and government should ensure the provision and usage of Information and Communication Technology (ICT) laboratories with internet facilities for learning biology in senior secondary schools.

Key Words: Self-directed learning, Conventional, Enhanced, Achievement, Biology

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29. The Mathematics-Language Proficiency: The Learners Perspective

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Abstract

Mathematics is considered a difficult school subject by majority of learners. For many students, mathematics is a series of hurdles and challenges-a task made with continued failure and seeming irrelevance in spite of the value that mathematics plays in society. The effect of this has been unwilling class participation, disinterestedness, haphazard solving of mathematical tasks, plus low achievements and failure to communicate mathematics. This state of affairs propagated the topic of the paper: "The Mathematics-Language Proficiency: The Learners' Perspective". The objective was to find out the nature of the relationship between proficiency in mathematics vocabulary and conceptual understanding of mathematics. The Socio-Cultural Theory propounded by Vygotsky in 1987 guided the study. The study employed multiple-case study design in three categories of schools, that is, Sub-County School (SCS), County School (CS) and Extra-County School (ECS). Data were collected by questionnaires, classroom observations and interviews. The study found out that there exists a strong positive relationship between mathematics vocabulary and conceptual understanding. Further students from different backgrounds of schools displayed similar challenges in interpreting mathematics vocabulary. The study concluded that proficiency in mathematics vocabulary is necessary for conceptual understanding of mathematics. The study recommends learners to be supported to develop mathematical English to help them participate fully in mathematics lessons by thinking about mathematics and expressing their thinking.
Key Words: Mathematics, mathematics vocabulary, Proficiency, Conceptual Understanding

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30. Enhancing students' achievement in biology using inquiry-based learning in Rwanda

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Abstract

Students in secondary schools in Rwanda manifest difficulties in learning science subjects including biology. Studies revealed that inadequate teaching methods dominated by teacher-centered traditional or conventional educational strategies are some of the factors that cause difficulties in learning, which in turn leads to poor achievements in biology. This study investigated the effect of inquiry-based learning (IBL) using 5Es instructional model (Engage, Explore, Explain, Elaborate and Evaluate) on secondary school students' achievement in biology. There were 231 secondary school students from six schools in Rwanda constituted the sample. A quasi-experimental quantitative approach consisting of pre- and post-tests was used for data collection. Descriptive statistics were used for data analysis. Results indicated that the mean of post test score of experimental groups was higher than the mean of counterparts in control group. Further, t-test and ANCOVA were used for inferential statistics. Findings showed once again significant differences between experimental groups taught with IBL and control group taught with conventional teaching methods. There was no significant effect on gender while a significant difference based on school location was identified. The study recommends educational stakeholders to use the IBL designed by 5Es instructional model at school level to solve problems related to poor performance in biology.

Key Words: Inquiry-based learning, Biology education, Students' achievement

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31. Detecting Change in Distribution using Modified (MIC) Energy Statistics.

Authors

Abstract

In this research, a test to detect change in the distribution of sequence of independent random variables is proposed. To achieve this, we exploit the relationship between properties of U-statistics and Energy statistics (forms of V-statistics) to come up with a nonparametric test based on modified information criterion (MIC) in the change point detection. To investigate the performance of our proposed method, we assess the finite sample properties and compare efficiencies and powers of different methods with those of our method through simulations. We then discuss applications of our proposed test in different real-life examples (Kenyan and Saudi Arabia Covid-19 and Kenyan GDP) for detecting change in mean and variance, respectively.

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32. Effect of problem-based learning on students' problem-solving ability to learn physics in Ugandan secondary schools.

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Abstract

A learner's success is supported by the ability to understand real-world problems. This study aimed to examine the effect of problem-based learning (PBL) on problem-solving ability in the teaching and learning of physics. The study was guided by socio-constructivism theory. A quasi-experiment was conducted with 829 Senior-2 Physics students (age 13-15) from eight (8) selected lower secondary schools in Sheema District, Uganda. Schools were assigned to treatment and control groups using a purposive random sampling technique. Students' problem-solving ability was measured by conducting a problem-solving ability test in each group before and after studying a chapter on simple machines in physics. Repeated measures ANOVA was applied for data analysis. The study's findings showed a significant improvement in students' problem-solving ability with simple machines in the treatment group compared to the control group ($p < .001$). Therefore, educators are encouraged to embrace learner-centered methods that enhance students' problem-solving abilities to help them compete in the world of work.

Key Words: problem-based learning, problem-solving ability, simple machine, Ugandan secondary school

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33. Potentials and limitations of GeoGebra in teaching and learning limits and continuity of functions at selected senior four Rwandan secondary schools

Authors

Abstract

With the use of a variety of digital tools, services, and applications to enhance the learning environment, technology is now deeply interwoven within the educational process. Technological, pedagogical, and content knowledge (TPACK) model was used as a lens to evaluate GeoGebra's potential and limita_tions in the teaching and learning of Limits and Continuity of Functions. Intact classes were assigned as experimental and control groups purposively. The study subjects were 252 students and 78 mathematics teachers. The Limits and Continuity of Functions Achievement Test and the Advanced Mathematics Teachers' Survey were the two data collection instruments. The findings revealed significant differences in conceptual knowledge (t [df] = -11.46, p > .05) and procedural knowledge (t [df] = -11.027, p > .05) between control and experimen_tal group. The output lacks detailed instructions, drawing out some function requires other content knowledge which is not covered by packages of GeoGebra like the graph of discontinuous functions is not automatically represented in a correct manner are some limitations heighted in this study. Results show the necessity of including GeoGebra in the teaching of Limits and Continuity of Functions

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34. Are Collective Bargaining Agreements Compromising Equity In Grade Promotion Of Post-Primary Teachers In Extra-County And National Schools? A Comparison Between Scheme of Service and Career Progression Guideline Approaches Of Implementation In Kenya

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Abstract

The use of two different implementation approaches for the 2017-2021 Collective Bargaining Agreement of post-primary teachers casted doubts on equity in grade promotion because each union was affiliated to its own approach. Given that there were two unions at post-primary level, the purpose of this study was to compare equity accruable between them in Kakamega County. The objective was to determine the difference in equity between the use of scheme of service and the career progression guideline approaches based on Teacher Performance and Appraisal Development tool for 2017-2021. It was guided by a socialist economics of education theory. A comparative research design with a sample of 1,569 respondents from 5,923 was used. Systematic random sampling was used to select teachers in each union, purposive sampling for principals and saturated sampling for sub-county directors of education and union secretaries. The study enhanced content validity with internal consistency reliability of instruments at 0.877. In data analysis, gini permutation test found promotion to be marginally equitably allocated in Kenya Union of Post-Primary Education Teachers than in Kenya National Union of Teachers through 0.0567 and 0.0698 coefficients respectively. However, the pairwise correlation established plausible interactions between study variables at Î± = 0.05 with membership in Kenya Union of Post-Primary Education Teachers being statistically insignificant to promotion (pËƒ.05). The logistic regression analysis found a statistically significant difference (pâ‰¤.05) between the two unions with an extra TPAD score in 2017, and teaching in extra-county and national schools reducing the odds of promotion to the next grade.

Key Words: Equity; Grade Promotion; Collective Bargaining Agreement; Trade Union; Scheme of Service; Career Progression Guidelines; Teacher Performance and Appraisal Development

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35. Competence-Based Education: Reimagining, Reorienting and Redistributing Mobile Applications Technology and Performance Of Agricultural Projects: A Case Of The Digifarm Sunflower Project In Makueni County, Kenya.

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Abstract

Evaluating the extent of the influence of mobile technology on the performance of projects is critical to shedding new light and contributing knowledge to solve project performance glitches. The aim of this study was to establish the influence of mobile applications on the performance of agricultural projects. This study adopted a mixed-methods approach to ensure a comprehensive assembly and triangulation of requisite data to respond to the survey objectives. The target population for this study was all 217,000 sunflower farmers in Makueni County who subscribed to the DigiFarm mobile application. The sample size for this study was 208. Questionnaires and key informant interview guides were the main research instruments used in this study. A pilot test was conducted using 21 instruments that were administered to farmers in Makueni County. Descriptive statistics in the form of frequencies, percentages, mean and standard deviation were utilized to analyze quantitative data. Simple linear regression was used to test the strength and the direction of the relationship between the variables and to predict the variability of the dependent variable based on the independent variable. It was established that mobile applications had a positive significant influence on the performance of agricultural projects in Makueni County. The study concluded that mobile applications influence the performance of agricultural projects in Makueni County. For further research, the study recommended the adoption of machine learning in enhancing the performance and sustainability of agricultural projects.

Keywords: Mobile Applications, DigiFarm, Performance of Agricultural Projects

36. A Critical Review of Microbial Fuel Cells for Wastewater Treatment in Africa

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Key Words: **Ecological balance, green economy, microbial fuel cell, sustainable water treatment, wastewater**

The continent of Africa grapples with constricted access to clean and sustainable water resources while preserving the ecological balance of its vast natural environments. Wastewater treatment is critical in this pursuit. This research investigates the potential of microbial fuel cells (MFCs) as an eco-friendly solution for wastewater treatment, in the auxiliary symphony of catering to the increasing human demand for clean water resources and the imperative to protect the aqua-ecosystems. Microbial fuel cells effectively treat wastewater while generating electricity, offering a sustainable and environmentally friendly solution. review delves into the topical status of MFC applications in wastewater treatment across the African continent. A

comprehensive analysis of the existing literature was conducted to identify the latest innovations, challenges and drivers associated with MFC adoption in Africa. The viability and sustainability of MFC technology in multifarious environments was evaluated to identify the socio-economic and environmental factors that influence its adoption. This review illuminates the path towards sustainable, eco-friendly wastewater treatment solutions in Africa, offering invaluable insights to stakeholders and researchers expediting the broader advancement of engineering and environmental sciences while upholding the principles of a circular economy.

37. Parasitological Malaria Indices Potentiating Transmission in Artisanal Gold Mining and Sugarcane Growing Regions of Western Kenya Highlands

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Key Words: Malaria, Artisanal gold mining, Sugarcane farming, Western Kenya Highlands

Background: Western Kenya highlands have witnessed resurgence of malaria.

Objective: To determine parasitological indices potentiating the resurgence of malaria transmission in gold mining and sugarcane farming regions of Western Kenya highlands.

Methods: Participants of age between ½ - 80 years were enrolled in the study. Blood samples were collected in August and November 2020 and February and May 2021. During these passes, questionnaires were administered to find the occurrence of malaria episodes in the households. Rapid diagnosis, blood smears, and polymerase chain reaction were used to determine the prevalence of malaria, Plasmodium density, and diversity. Data was analyzed by GraphPad prism in which a t-test was used to test association at 95% CI and $p \leq 0.05$ was considered statistically significant.

Results: Responses from questionnaires and microscopy showed malaria prevalence was at 37.67% and 8.96% respectively. There was a significant difference in malaria prevalence across the four seasons ($t=7.144$, $df = 3$, 95% CI 29.67 – 77.33, $p = 0.0056$), while it was not age-dependent ($t=3$, $df = 2$, 95% CI -10.36 – 153, $p = 0.0641$). The mean Plasmodium parasite density at 95% CI was 4,840 (250 – 18,000) parasites/µl of blood.

Conclusion: There is a high malaria index within the population in the two sites. An asymptomatic pool of malaria cases acts as a reservoir for malaria transmission.

38. Water-energy-food nexus security in the Horn of Africa

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Key Words: Climate change, renewable energy, sustainable development, water scarcity, water-energy-food index

T*he attainment of sustainable development goals (SDGs) by countries is achieved through water-energy-food (WEF) nexus framework. Water, energy and food security are critical pillars for sustainable development and thus forms the primary goals for every Country. However, these critical sectors are threatened by climate change, rapid population growth and urbanization in the Horn of Africa. The main aim of this review is to assess the status and prospects of WEF nexus as it relates to SDGs in the horn of Africa as compounded by climate change. The countries considered were Kenya, South Sudan, Tanzania, Ethiopia, Eritrea, Somalia and Djibouti. The review indicated that the eight countries have a challenge in achieving SDGs 2, 6 and 7. Kenya has the highest (51.4) WEF index in the region followed by Djibouti (50.9) and then Tanzania (47.7). Ethiopia and South Sudan had WEF index of 47.5 and 37.5 respectively. Somalia (36.8) and Eritrea (35.8) had second and lowest WEF indices respectively. The energy sub-index was the best performer in the region with an average index of 53 while water and food sub-indices were the worst at 40. Political instability, insecurity, inadequate institutional and physical infrastructure and climate change are the main challenges facing WEF security in the region. Climate change mitigation and adaptation measures should be integrated into the WEF nexus.*

39. Realization Of Inclusive Learning Using Enhanced Assistive Technologies And E-Didactics Among Visually Impaired Students in Kenya's Tvet Institutions

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Key Words: Assistive technology, Pedagogy, E-didactics, Visually impaired

Education for all, as advocated for by the United Nations is a basic building block for every society because it is a right for everyone. Therefore, countries need to invest in education for everyone including special needs students to build a prosperous and equitable society. The Kenyan government has put a lot of investment in policies, practices, and infrastructure in order to offer an inclusive education for all learners at all levels of education including special needs students. However, some special needs students like the visually impaired students have been disadvantaged. This is due to the lack of proper and enhanced assistive technologies that are necessary to mould competent individuals. This paper focused on different available Assistive Technologies (AT) for visually impaired people in the world ranging from low-tech to high-tech devices. The paper also focused on the technologies that have been applied in Kenya to assist in teaching and learning among visually impaired students in TVET institutions. It was found that despite all interventions put in place by the Ministry of Education to help visually impaired students achieve higher learning, the ministry has not sufficiently invested in the latest technologies needed. This has made many visually impaired students stay away from school while few who remain struggle to read and learn in order to acquire education just like their sighted counterparts. Firstly, it was found that Classical Braille which is mostly used in Kenyan institutions is outdated, noisy, expensive, and inefficient for competency-based education and training. Secondly, Orbit readers used by a few institutions are more advanced than classical Braille machines as they make use of digital content, are portable, and do not require reams of paper. Nevertheless, there is only one TVET institution in Kenya that has procured just a few Orbit readers for their students. despite that advancement, Orbit readers are slow in refreshing content, have no translators between Braille and other languages, and feature no browser nor Wi-Fi capability. On the other hand, the latest assistive technologies called Bonocle and Feelix which were used for the first time during FIFA World Cup in Qatar 2022 prove to be more effective for use by visually impaired people. The two ATs have never been used in Kenya before but are relatively cheap, small, handheld, and portable devices that enable visually impaired students to read, write, count, download education and entertainment applications, and play games. This is a great advancement in AT as these features were not available in earlier ATs. With these new technologies, the application of e-didactics in teaching and learning can become a reality among visually impaired students. The paper recommends that the government ought to use its mandate as enshrined in the constitution and various education policies to partner with high-tech companies in order to provide enhanced assistive devices for visually impaired students in the bid to channel out competent individuals.

40. Electricity security: adoption of low-cost technologies for remote community electrification

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Key Words: empowerment, e-waste, low-cost technology, sustainable development goals, sustainability

Rural communities in the developing countries are disadvantaged from the grid connection services, a scenario that does not align with the United Nations' Sustainable Development Goal (SDG) 7. This article presents a low-cost technology developed and tested experimentally in the laboratory at the Technical University of Darmstadt. The R&D involves the use of e-waste components and locally available materials to develop a modular hydrokinetic turbine for electricity production using kinetic energy of rivers in rural villages. A decommissioned boat motor with a 0.24 m diameter rotor blade is operated as a turbine. Various configurations of enclosing casings/shrouds were developed from 1.5 mm thick stainless-steel plates. The set-ups were tested in a flume to study their performance for energy conversion. A nozzle of 0.5 m length with a short diffuser extension of 0.2 m (for support purposes) produced a promising performance. The use of the 0.5 m nozzle produced 9.0 V at an approach flow velocity of 0.24 m/s, serving as a reference for comparison to the other configurations with similar flow conditions and the expected conditions in the field. This prototype technology can sustainably provide 24-hour energy, sufficient to charge batteries/solar lanterns during cloudy seasons in the villages and also provide opportunities within the community such as mobile charging points and local printing services. This research reveals that low-cost technologies that utilizes local materials can be resourceful in remote locations and most importantly in the developing countries where small amount of electricity is sufficient to enhance the socio-economic wellbeing of the society and reduce over-reliance on fossil fuels like diesel generators to power the villages. Additionally, provision of technical expertise empowerment to the local community would enhance the sustainability of the technology, by lowering its operation and maintenance costs.

41. Diagnostic assessment knowledge and practice among mathematics teachers: a sample of teachers from secondary schools in Dodoma-Tanzania

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Key Words: Assessment; diagnostic assessment; cognitive assessment; non-cognitive assessment

This study looked at how secondary mathematics teachers understand and implement diagnostic assessments in their mathematics classes. In order to understand how mathematics teachers, conceptualize diagnostic assessment and how they put it into practice, the study conducted in-depth interviews with a total of 20 secondary school mathematics teachers using a phenomenography research approach. Data from respondents were gathered, coded, and subjected to a thematic analysis. The results showed that most mathematics teachers are unfamiliar with the concept of diagnostic assessment, misunderstand its role in the teaching and learning process, and refrain from using it because they don't know how to do so efficiently. The few who really understood the concept acknowledged not practicing it because of the overcrowding in classes and were discouraged by the widespread failure of national examinations. The study suggests that it is essential to conduct in-service training to train teachers on the actual application of diagnostic assessment so that, once they are aware of the advantages of doing so, they will be motivated to do so in order to enhance the teaching and learning of mathematics and, in turn, to enhance students' performance in mathematics.

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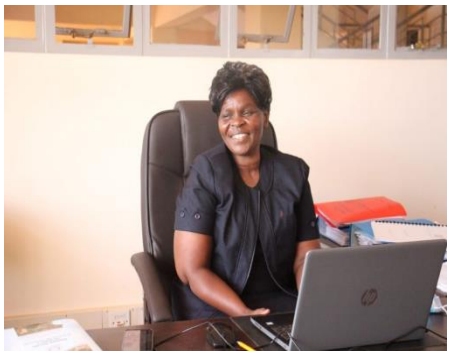
 Prof Kennedy Bota **Co -Convenor, Steering Committee**	 Prof Alice Ndiemma **Member, Steering committee**
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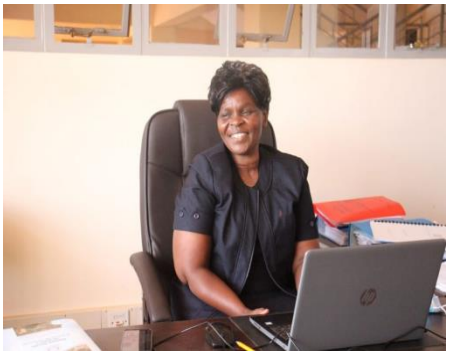

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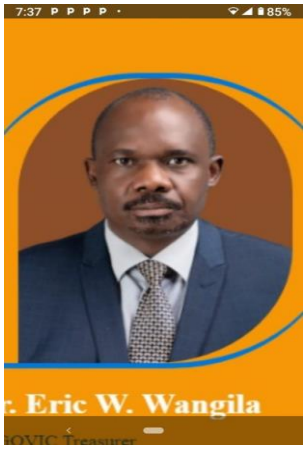
 Dr Bill Ouda **Member Secretariat , Sub Committee**	 Dr Erick Wangila **Member Scientific Sub Committee**

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