SCHOOL OF HUMANITIES

Masters

INFLUENCE OF CLIMATIC ELEMENTS AND NON-CLIMATIC FACTORS ON FISHING ACTIVITIES IN LAKE VICTORIA, KISUMU COUNTY, KENYA

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Fishing is known to be one of the oldest occupations of mankind all over the world. A significant proportion of people depend on fisheries activity; it generates income for the households, creates employment and provides a source of livelihood to the people around water bodies and beyond. However, fish catch and fishing activities in Lake Victoria, Kisumu County, is in great danger of fluctuation and decline. There is limited research to explain this phenomenon especially along the beaches in Kisumu County. This study aimed at establishing the influence of climatic elements such as dry spell, rainfall and strength of wind; and non-climatic factors such as overfishing, water hyacinth and predators on fishing activities in beaches of Lake Victoria within Kisumu County. The study employed descriptive survey design. The area of study, had thirty two beaches, out of which eight were sampled to represent the entire Kisumu County. Systematic sampling technique was used to sample the eight beaches. A sample size of 362 respondents was used to obtain data. Documented data on fish landing per month for ten years was obtained at the beaches as well as at Kenya Marine and Fisheries Research Institute (KEMFRI), and the climatic data was collected from Regional Meteorological Department located at Kisumu Airport. Questionnaires and interviews were used to collect primary data from the beaches, while secondary data was obtained from KEMFRI, books and publications by use of document analysis guides. The findings were coded and analyzed using the Statistical Package for Social Sciences (SPSS) programme which helped in calculating frequencies, means and percentages. The study found a significant relationship between climatic factors and fishing activities. Fish catches were influenced by the amount of rainfall, though the effect varied with fish types; Oreochromis \( r = .260 \), Lates niloticus \( r = .130 \) and Protopterus \( r = .184 \), however, Rastrineobola argentea and Claras gariepinus revealed a negative correlation with the amount of rainfall. Overall, the results revealed a positive correlation coefficients \( r = .079 \) between the amount of rainfall and the total amount of fish catch. Dry spell which is associated with high temperatures led to a decrease in fish in the Lake. Whereas mild or moderate winds were found to favour fish catch, strong winds had negative effect on fishing activities. The study also established that non-climatic factors too had immense negative influence on fishing activities in Lake Victoria. On the basis of the findings, the researcher made the following conclusions; there was a relationship between climatic elements and fishing activities, non-climatic factors mostly influenced fishing activities negatively; however, there were mitigation strategies put in place by the fishermen to help address non-climatic factors. On the basis of the findings it was recommended that, policy makers should regulate the harvesting of fish as dictated by climatic and weather variations; assess the impact of non-climatic elements in fish production and recommend appropriate mitigation measures and lastly regulations to be enhanced to save the endangered fish species from extinction.
This study acknowledges that communities in Kenya have cordially interacted with one another in various ways both in the pre-colonial, colonial and post-independence period. These cordial relations are sometimes interrupted by inter-ethnic conflicts that are either latent or manifest in nature. Most of these conflicts in Kenya are perpetrated by small militia groups which are consistently most active in the last and first quarters of each year following raiding patterns that tend to increase at the beginning of each rainy season. Some of the conflicts also tend to take place during the electioneering period. However, some communities have age-long conflicts dating back to the pre-colonial period which re-emerged in the post-independence period. These inter-ethnic conflicts may have many aspects including the economic, political, social, and cultural aspects.

This research sought to examine the different aspects behind the cross-border inter-ethnic conflicts in Kenya and their implications. This was done by investigating the relations between the Kipsigis and Abagusii along the Sotik-Borabu border. This research addressed three objectives: First, was to investigate the role played by politics in instigating the cross-border conflicts between the two communities under study. Second, was to analyze the role played by the social-economic factors in propagating the conflicts and lastly, was to assess the implications of the conflicts between the two communities under study. The study adopted Randall Collins’ analytic conflict theory which is based on differential distribution of resources; hence competition that leads to conflicts in the society. Stuart Kaufman’s symbolic/emotional choice theory was also adopted. Kaufman’s theory gives an explanation on how the security dilemma, group-mythologies that justify enmity with another group combined with elite and mass interaction within and between ethnic groups cause ethnic conflicts. The study was limited to the period between 1963 and 2002. The research was confined to Gelegele Location of Ndanai Division of Ndanai Constituency, Bomet County and Esise Location of Borabu Division of Borabu Constituency, Nyamira County. Other than sharing a border, the two locations have been selected because they have been in conflict with each other. Both primary and secondary data were used in this study. The research was qualitative in nature and the researcher used a descriptive research design. Purposive sampling and snowball sampling techniques were used to reach out to the informants. Interviews and questionnaires were employed as key research instruments. The targeted groups of respondents were educationists, public administrators, religious leaders, residents, Non—governmental organizations dealing with peace building along the border and business persons. The research came up with factors like exclusion politics, re-introduction of multiparty politics, incitement from politicians and failure of security forces as the political factors. Social-economically, factors like raiding, land and unemployment contributed to the conflicts. The conflicts also caused more negative effects than the positive ones on the Abagusii and Kipsigis. The results were then checked for any serious flaws and then thematically analyzed based on the objectives of the study and presented in the narrative form.
HOST RESISTANCE AND INTERACTION BETWEEN ROOT KNOT NEMATODES AND FUSARIUM WILT OF TOMATO

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Tomato (Solanum lycopersicum L.) is one of the most popular vegetable crops grown worldwide, owing to its nutritive value, income generation and diversified use. Tomato cultivation in the coastal region of Kenya is limited by root knot nematodes (Meloidogyne spp.) and Fusarium oxysporum. A survey was done in five farming counties of the Coastal region of Kenya. Meloidogyne spp. and F. oxysporum were isolated from diseased tomato plants and identified. Host resistance and interaction between root knot nematodes and Fusarium wilt pathogens was evaluated on five tomato cultivars under screen house and field condition. Root knot nematodes identified were Meloidogyne incognita, M. javanica and M. arenaria. However, there was a novel species that was also isolated and identification is ongoing. Combined inoculation of Meloidogyne spp. and F. oxysporum caused a significant reduction (p ≤ 0.05) in crop growth (shoot height, shoot dry weight, root length, root dry weight) when compared to the un-inoculated controls or single pathogen inoculated treatments. When inoculated singly, Meloidogyne spp. reduced crop growth significantly (p ≤ 0.05) than F. oxysporum inoculated. The population of Meloidogyne spp., number of galls and egg masses were significantly lower (p ≤ 0.05) when the Meloidogyne spp. and F. oxysporum were inoculated in combination. Cultivar Okistu 101 was tolerant to nematodes-Fusarium wilt disease complex and had the highest fruit weight (6371g). Tomato cv. Hawaii 7996 was resistance to disease complex and needs to be introduced into tomato farming system in Kenya.
Access to quality water remains a key indicator of an improved social and economic life of any community. Due to an increasing human population, changes in land use activities and climate variability, Nyangores Basin in Kenya has been under pressure and for this reason, availability and access to quality and sufficient quantity of water has been adversely affected. Despite government plans to ensure all households access piped water; this has not been achieved as
coverage is still very low. The main cause of lack of access to quality water from improved sources for household use is unclear. In addition, household access, distribution and management of improved water demand including rural water supply coverage and maintenance of water distribution systems in the basin is not documented. The objectives of this study were to determine the magnitude of household water demand, identify key factors that influence the magnitude of water demand and distribution and to examine the effectiveness of the current water use management strategies in Nyangores sub-catchment. The study employed descriptive statistics based on survey responses from a total of 300 households picked from Silibwet, Bomet and Sigor divisions. Household level data was supplemented with key informant interviews of 20 professionals from the Ministry of Water and Irrigation, Water Service Board and WRMA officials. The study also relied on secondary data from the National Housing and Population Census report and the meter reading reports at the District offices. Data was entered, coded and analysed using SPSS version 19 and Ms-excel. Results indicate that income, household size and distance from homesteads to water sources are major determinants of domestic water demand. Human population has been growing rapidly and is putting a lot of pressure on available water resources, whose quality has greatly deteriorated due to intensified human activities such as agriculture and livestock production. The current mean water demand stands at 9,745 m$^3$ per day, which is largely met by unsafe water sources. Women and girls bear the greatest brunt of water related access constraints because they spent a lot of time fetching water and this also exposes them to health and safety risks. The expansion of piped water supply is slow with only 5.3% coverage since 2003. The community water use management strategies are below 30% and UfW is 53.77% up from a benchmark of 25%. Non-payment of water bills is increasing at the rate of 4% per month. Management strategies currently employed include rationing, public education on efficient water use while metering, pricing and enforcement of legislation on water governance are employed on a limited extent. The study recommends the county and national governments to promote watershed and basin protection, harnessing of underground water resources and investment in more rain water harvesting infrastructure to reduce reliance on rivers. It is important to promote efficient use of water by the local community, promote growth of non-agricultural income generating activities to create effective demand for water and aim to supply safe water to within a radius of 200 metres from homes.

HUMAN RIGHTS IN THE RECONFIGURATION OF AID RELATIONS: THE CASE OF CHINA-KENYA RELATIONS

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The study explored human rights in the reconfiguration of aid relations with a particular focus to China-Kenya relations. The study used other African countries such as Zimbabwe, Sudan, and Angola as cases of illustration to ground the thesis’ argument. The study sought to realize the following objectives: find out the dominant features of China-Africa foreign aid relations, analyze the nature of China-Kenya relations since independence, survey the trend of Kenya’s foreign aid relations, and examine possible links between China-Kenya foreign aid relations and
Kenya’s human rights profile. To achieve these objectives, the study used both primary and secondary data. Primary data was obtained using interview guides while secondary data was subjected to critical textual analysis and interpretation to test the relevance and accuracy of the document for the purpose of the study. The obtained qualitative data was analysed thematically. The study sought to find out if we could theoretically situate China-Kenya relation among the trend that has defined the relationship between China and other African countries. Thus two variables were analyzed; foreign aid and human rights. The study adopted the Rational Choice theory to explain the Sino Kenyan relations. Sampling was based on purposive technique. Based on these principles, the premises of this study were analysed and it was observed that since 2002, when the NARC government took over power the shift towards China became unprecedented with China rising to become Kenya’s main foreign aid partner. The study found out that China-Kenya relation since independence has been defined by prevailing global political trends. The study concludes that what is engineering the relations between the two countries partly are pull factors (attractive conditions) and the main pull factor is China’s no strings attached policy. The study reveals that China’s economic concerns far outweigh its interest in enhancing human rights in the country. Although the study highlights the importance of China to Kenya as an important economic partner, it proposes the need to put in place measures to guarantee transparency in dealings between the two countries.

INTRA-ETHNIC RELATIONS AMONG THE SABAOT OF MT.ELGON, KENYA, 1945-2010

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This study focuses on the intra-ethnic relations among the Sabaot community of Mt. Elgon Sub-County, from the period 1945 to 2010. The study only focuses on the Sabaot found in this Sub-County. It also picks out the Sabaot ethnic group in a multilingual area of study. The study took a historical analysis of intra-ethnic relations as an ingredient of conflict on one hand and peace building on the other. It is argued that inter and intra-ethnic relations in the area of study are not only complex but subtle to the extent that cooperation, unity and conflict occurred either within specific ethnic or sub-ethnic composition or as across ethnic confines. However, most analysts have focused on inter-ethnic rather than intra-ethnic conflict and resolution in the area under study. Whereas inter-ethnic relations deserve attention in their own right, their nature in fact
depends on the character of relations within a community. The ethnic group also has its own intra-ethnic relations that deserve attention. The focus of this study was to add to the available but limited knowledge on the study of intra-ethnic relations in general and the Sabaot in particular, from a historical perspective. The historical periods illuminated the changes that took place in the community and how they influenced conflicts within the various clans. It also showed how these conflicts have been handled by the stakeholders. Evaluation of the study utilized Constructivism and Instrumentalism theories. Constructivism was helpful in interrogating the origin of Sabaot clans; thus tracing its identity construction or invention to the colonial authorities and emergent nationalism as well as emphasizing its historicity and fluidity. It demonstrated an evolution of an ethnic group that kept transforming its social, political and economic set-up that sooner became a precursor to conflicts at the same time offering insights of peaceful co-existence. Instrumentalism helped to analyse the role of politics and political class in intra-ethnic manifestations. This is an aspect that brews conflicts and can be looked at as one of the major tools to be used in promoting peaceful co-existence. The two theories complemented each other to fully analyse the topic under study. The study utilized primary and secondary techniques of collecting data. The primary data collection methods included oral interviews, which have mainly been used in reconstruction of African history and in qualitative research design that this study utilised. The oral interview questions were open ended to help gather a wider scope of information. Other sources of primary data included information from the Kenya National Archives (KNA) and governmental documents like the parliamentary Committee Reports. The study also drew information from secondary sources, which included; text books, journals, theses, and dissertations from across libraries; seminar and conference papers, Non-Governmental Organizations (NGO) reports and print and electronic media. The collected information coupled with the researcher’s analytical contribution helped make useful conclusions to the intra-ethnic problem in the area of study.

DYNAMICS OF COOKED FOOD VENDING IN

KAYOLE LOCATION, NAIROBI COUNTY, KENYA

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Rapid growth of urban population has been accompanied with growth in urban poverty mostly due to high rates of unemployment. This has in turn caused development of informal sector to generate income and provide essential goods and services. Cooked food vending or street food provision is one such service provided by the informal sector in urban areas. This study
examined the dynamics of cooked food vending in Kayole location, Nairobi County. The study investigated factors contributing towards cooked food vending; both from the vendor and vendee perspective. To determine the factors contributing to cooked food vending, the study evaluated the socio-economic characteristics of the vendors and the vendees, analyzed benefits of cooked food vending and finally identified challenges facing the practice. Data was collected from a sample of 83 cooked food vendors and 89 cooked food vendees from the study area using stratified random sampling. The research design employed was a descriptive survey with the use of a questionnaire and key informants interviews to collect both qualitative and quantitative data. The quantitative data from the study area were entered into the computer spreadsheets and analyzed using statistical package for social sciences. The data analysis showed that cooked food vending largely benefits the low-income earners and the unemployed. Income rather than level of education was the most important factor that determines choice to become a food vendor. This sector provides employment and is an important source of food for many. Government agencies do not provide support but rather are extractive agencies that collect revenue from the food vendors and harass the food vendors through arrests. The study thus recommends change in government approach ways of handling the sector and encourages self-regulation to address some of the challenges experienced in the sector.

THE IMPACT OF SELF-HELP GROUPS ON WOMEN’S ABILITY TO MEET BASIC FAMILY NEEDS IN MAKUYU LOCATION, MURANG’A COUNTY, KENYA

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The purpose of this study was to establish the impact of Self-Help Groups (SHGs) on women’s ability to meet basic family needs in Makuyu Location, Murang’a County, in central Kenya. Specifically the study set out to identify the types of activities in SHGs that help women to meet basic family needs; establish the basic family needs that women address with the proceeds from SHGs; investigate the challenges faced by the SHGs in their operations; and suggest appropriate strategies for addressing such challenges. The study was guided by Women’s Empowerment Framework by Sara Longwe. The study utilized descriptive survey design, with a target population of 79 registered women SHGs, out of which 8 were selected as the study sample. A total of 96 ordinary members from the sampled SHGs were randomly selected to participate in the study. The area chief, the community development assistant and 3 officials in each of the selected SHGs also participated in the study as key informants. Data collection tools were interview
schedules for the key informants, Focus Group Discussion guide for ordinary members in the selected SHGs and an Observation check list. The data was analyzed qualitatively on the basis of the themes generated from the study objectives. The study established that the major activities carried out by the SHGs were merry-go-round, revolving loan schemes, small scale businesses and social welfare activities. The women used the benefits from SHGs to address family needs which included food, household items, education expenses, income generation and shelter. The challenges that hindered the effectiveness of SHGs included low participation in group activities, poor utilization of group funds, poor leadership, default in loan repayment, and lack of space for group projects. Introduction of higher penalties, capacity building, adoption of viable agricultural projects, and initiating men into women’s SHGs were suggested as strategies of overcoming the challenges. On the basis of the findings, the study recommends that the District Social Development Officer (DSDO) should organize capacity building workshops for group leaders, to inculcate appropriate book keeping and group management skills. Members of SHGs should also be sensitized on how to access and utilize resources from empowerment initiatives. Further, Civil Society and Religious institutions should sensitize the community on effects of culture and customs on gender-power relations in the household. The County government should also encourage NGOs, FBOs, CBOs, and other grass root organizations that have a specific focus on SHGs to invest in programmes geared towards alleviating poverty in the area.

SECURITY SECTOR REFORMS AND THEIR IMPLICATION IN FIGHTING AGAINST TERRORISM IN KENYA (1998-2015)  
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The growing threat of global terrorism to various countries’ national security prompted most governments such as Kenya to make reforms in the security sector to mitigate the vice. The study explored security sector reforms and their implication in the fight against terrorism in Kenya between 1998 and 2015. The study sought to realize the following objectives: examine the conceptual issues and origin of global terrorism; explore the trends of terrorism in Kenya (1998-2015); analyse the relevance of the reforms in the security sector in fighting terrorism in Kenya since 1998-2015; and to assess the effectiveness and implications of reforms in the security sector in mitigating terrorism. To achieve these objectives the study used both primary and secondary data. Primary data was obtained using in depth interview guides while secondary data was subjected to critical textual analysis and interpretation to test the relevance and accuracy of the document for the purpose of the study. The obtained qualitative data was analysed thematically. The study found out that global terrorism has been in existence since human civilization. However, it has been changing in terms of the target audience, modus operandi and ideology. The study also found out that Kenya has been a target of increased attacks due to the government’s intervention into Somalia following a spate of attacks by Somalia based terrorist
The vulnerability of the country to terror attacks had prompted the government to carry out various security sector reforms from 1998-2015 in order to mitigate the vice. These vary from institutional reforms to policy formulations and regional and international cooperation. The study demonstrated that though these reforms were geared toward addressing the runaway insecurity in the country, they have fallen short of applying appropriate mechanism in addressing the underlying causes, which make the country a soft target for terrorist activities. This is because terrorist attacks resulted from continued securitization of terrorism. This therefore, requires wider reforms, which often result in heavy handedness of the government in addressing incidents and terror suspects. Therefore, the Kenya government has found it challenging in addressing the threat of terrorism since it is supposed to balance liberty and security.


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The study sought to investigate the role of the Anglican Church of Kenya (ACK) in peace-building in Mathare Informal Settlement (MIS), Nairobi County. The ACK mandate in peace building is contained in the Provincial Synod resolutions of 1982. The synod resolved to spearhead peace-building in Kenya and fight evils that hamper cohesion in the society. ACK’s
commitment to peace and conflict resolution is widespread and clearly articulated in the Provincial Strategic Plan adopted in September 2000. Despite the ACK peace building mandate MIS had continually suffered adversely from conflicts linked to political differences, scramble for resources, militia groupings, illegal economic activities and negative ethnicity, among others. The study was based on the premise that ACK play an important role in peace-building and as such examined the role the ACK had played in peace building especially with the establishment of the Justice and Peace commission (JPC). This study was guided by the biblical paradigm of peace and tranquility that underscores harmony in any given community. Data for the study was drawn from both primary and secondary sources. Field research was carried out in MIS by use of self-administered questionnaires, focus group discussions (FGDs) and oral interviews (OIs). In this study, the researcher employed purposive sampling and snow ball methods to select respondents. The researcher targeted a sample size of 128. Qualitative method of data analysis was used; data was synthesized thematically according to the study objectives and envisaged chapters. The study revealed multiple forms and causes of conflict in MIS. It also indicated that conflicts adversely affect MIS and particularly women and children. The study also established that ACK played a key role in peace building in MIS. The study indicated that re-organization of ACK’s JPC as a fully-fledged department with adequate staffing would help address the perennial conflicts in MIS. JPC would help in developing peace building strategies, policies, monitoring peace processes and evaluation. The study has concluded that the ACK is capable of cascading peace in MIS owing to her high presence and large membership in MIS. The position of the church in the society as a trusted local institution, source of hope, reconciliation, love and forgiveness enhances her mission in peace building.


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This study examines the motifs of discontent and dissidence in the two novels by the South African poet, playwright and novelist Lesego Rampolokeng. The study is based on the premise that black South African writers use literature as a vehicle for self-expression to communicate the traumatic pain of systemic racism of apartheid as a lived experience that still influences the way black South Africans relate with themselves and with others whose existence is shaped by the psychological affect of apartheid. The primary goal is to demonstrate fictionalized discontent and dissidence as social metaphors deployed by Rampolokeng to communicate the aberrations of apartheid and to show their connectivity to the existential realities of black subject especially at the linguistic and psychological levels. The study employs the psychoanalytic theory to analyze the two novels in order to unearth their fictionalized resistance and its significance at the level of themes. The theoretical framework will lean on the connection between language and psychoanalysis as posited by Jacques Lacan, Julia Kristeva and Melanie Klein. This study employs textual analysis as the methodology for collecting, organizing, interpreting and analyzing data on the social metaphors of discontent and dissidence from the two novels. Many studies have been carried out on Rampolokeng’s poetry but little on his two novels which are the concern of this study. Consequently, the study widens the critical horizons by which Rampolokeng’s literary works can be read and interpreted. By approaching the two novels under the aesthetics of discontent and dissidence to communicate the common themes, the study underscores the insistence, relevance and commitment to social justice of this South African writer making him an important voice in both literature and reality emanating out of South Africa.

Key words: Rampolokeng, Protest literature, Psychoanalysis, Textual resistance, Apartheid.

AN ASSESSMENT OF EFFECTS OF HUMAN ACTIVITIES ON VEGETATION CHARACTERISTICS IN CHEPALUNGU FOREST; BOMET COUNTY, KENYA

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Department: Geography
Biodiversity values at forest ecosystem depend on how people use, manage and interact with the forest trees and trees outside the forest. Between 1990 and 2010 Kenya’s forest cover significantly reduced by 6.5%. The aim of this study was to assess the effects of human activities on vegetation characteristics in Chepalungu Forest (CF). Specifically, the objectives were to establish human activities affecting vegetation in CF, determine vegetation characteristics, establish local community’s perception on conservation measures and discern viable conservation measures in CF. Primary data constituted responses from randomly sampled local community, the herbalist, cultivators and foresters interviewed. Their response rate was 96%, 100%, 100%, and 60% respectively that were analyzed in SPSS. Obtaining firewood, grazing fodder, honey, herbs among others occurred very frequently in 88%, 83% 93%, and 90% respectively. Cutting, trampling and browsing as disturbance on trees accounted for 73%, 15% and 12% respectively. 98%, 81%, 75% and 40% of the respondents considered charcoal making, grazing, and browsing and firewood collection to be very destructive human activities occurring in CF respectively. The forest has decreased in a margin of 9% between 1985 and 2010 in its area with 7% attributed to clear-cutting established using change detection technique. CF has a tree diversity of 0.6, 0.4 and 0.3 in the edge, core and middle zones respectively measured on Simpson Species Diversity Index. It is dominated by Acokanthera schimperi, Teclea simplifolia and Euclea divinorum with common height of 3 m and range of 1 m to 7 m. This data was collected using stratified random sampling with established square quadrants along line transects. The forest is managed by protecting and replanting trees which 91% and 76% of residents and forest officers considers inadequate. The local community feels alienated from the conservation as 89% are of the view that conservation management be done by the residents. Collaboration of all stakeholders is preferred by 87% of the respondents and 95% proposed that fencing be done compared to 82% in favour of planting trees on farm among other viable conservation measures. Chi-square was conducted to test the significance of association. The forest has been over exploited by unregulated use. It has low tree diversity and diminishing potential for natural regeneration without which no conservation can be said sustainable. The community has the will though not involved thus alienating them. It is recommended that clear guidelines on the legal activities be developed by the forest department with public participation to regulate use of its resources. The forest department to develop inventory on what they are conserving to allow periodic audit that will guide conservation strategies. Determine and guide annual allowable cut. The forest department to embrace participatory management by encouraging and supporting the formation of community forest association.
The first three gospels in the New Testament give their records in a similar way of expression, content and structure. These Gospels however, differ in some details hence bring the existence of the similarities and differences which have been called the Synoptic Problem. Based on this problem, various scholars have come up with theories from different parts of the world to find out a solution. The purpose of this study was to develop a Pastoral approach for the Synoptic Problem, a simplified approach of studying the Synoptic Gospels with Church members. This study was done in Musoma town Tanzania to help Seventh-day Adventist (SDA) members harmonize between their belief on trustworthiness of the word of God and the differences and similarities which emerge in the story of Gadarene demoniac in the Synoptic Gospel. The following objectives guided this study; To investigate SDA’s presupposition of the reading the Bible in Musoma town, to assess the local members understanding of the differences and similarities in the Gadarene demoniac story in the Synoptic Gospels among SDA members in Musoma town, and to analyze a pastoral approach for the differences and similarities in the Gadarene demoniac story in the Synoptic Gospel among SDA members in Musoma town. The research design employed qualitative approach. The researcher used contextual Bible Study theory to re-read the Gadarene demoniac story with 376 participants. Instruments for data collection were interviews and focus group discussions whereby 368 church members were divided to 46 Focus Groups Discussions with 8 members per each group, four Pastors were put in one session of Focus Group Discussion and four church leaders were interviewed separately in their offices. The researcher did a Biblical exegesis for the linkage of SDA church context and Biblical context. Data was presented according to the different views of church members, Pastors and church leaders and was finally analyzed into themes. Research finding shows that, SDA church in Musoma believes that writers who had different education, background and personality were inspired by thoughts which did not limit them to visit other sources. They were led to compose their canonical gospels focusing on the need of their audiences. Therefore, the pastoral approach analyzes that the writing process made them focus on specific issues which in turn affected their style, form, rhythm, occurrences, inclusion and vocabulary of each presenter and
finally differences and similarities came upon their canonical gospels. Further study of the pastoral approach for the Synoptic Problem in the scope of other denominations and relationship between inspiration and the free use of intellectual knowledge of Biblical authors are recommended.

ACCESS AND EFFECTIVE PARTICIPATION OF ADULT BASIC EDUCATION PROGRAMMES IN NAKURU-NORTH SUB-COUNTY, NAKURU COUNTY, KENYA: C. 1963-2014

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According to 1999 Population and Housing Census, an estimated 4.2 million adults in Kenya were illiterate, 60% being women. According to vision 2030, Kenya aims at achieving 80% adult literacy in order to transit the country to a middle level economy. This study investigates the determinants of access and effective participation of Adult Basic Education Programmes in Nakuru-North District, Nakuru County, from independence to 2014. This study area has been experiencing poor participation in terms of low attendance, access, and high drop-out rates. The study was guided by the Human Capital Theory based on the work of Schultz 1971), Sakamata
and Power (1975) that justifies substantial expenditure on education in order to improve production capacity of the population of any given country. The objectives of the study were: to summarize Kenya Government Policy on ABE programmes since independence; to identify factors that have influenced access and participation in ABE programmes in Nakuru North District since independence; to establish trends in participation in ABE programmes in Nakuru North District and to suggest intervention measures to improve access and participation in ABE programmes in Nakuru North District.

The target population was 100 adult learners, 20 adult teachers and two adult education officers. The sample size was 60 adult learners, 6 adult learners selected from every ABE centre, 10 adult teachers, one teacher from every centre and one District Adult and Continuing Education Officer. From the Sub-County office. The descriptive method of research was used. Data was collected by use of questionnaires, face to face interviews and personal observation schedule. The findings were analyzed using descriptive method. It was presented using frequency tables, graphs and percentages. The major findings were: there is gender disparity in terms of teachers and learners ratio in favour of the female gender; all teachers are professionally qualified; over 80% of the learners were almost illiterate when they enrolled; 60% of the teachers were on permanent employment and teachers are over worked and underpaid; most of the lessons are conducted in churches; learners with special needs are not facilitated at all in the area of study among others.

The study recommends the government to employ more teachers; promote learners to post-literacy level once they complete the basic levels; start more ABE centres to make programme visible and accessible to many learners; revive dead centres by sending teachers; allocate more funds to the programme; involve other stakeholders to fund the programme among others.
This study investigated trends of internal displacement in Kenya; the case of Kuresoi North Sub-county in the period 1992 - 2008. The sub-county is inhabited by several ethnic groups although the Kipsigis, the Kikuyu and the Kisii are the most populous. Since the introduction of multi-party politics in 1991, the sub-county has been experiencing political violence resulting into internal displacements during 1992, 1997 and 2007 General Elections. The study was guided by three objectives; to investigate the motives for internal displacement, to examine patterns of internal displacement and to analyze the consequences of internal displacement in Kuresoi North Sub-county in the period 1992 - 2008. The study was predicated on three fundamental premises. First, internal displacement in the area of study was motivated by political competition. Second, patterns of internal displacement occurred during General Elections’ time. And finally, the internal displacement led to loss of livelihoods of the residents. The reviewed literature showed that although there is much literature on ethnic violence at international, regional and national levels, little effort has been made to interrogate the motives, patterns and consequences of internal displacement in Kuresoi North Sub-county. This gap justified the need for this research. The research employed Protracted Social Conflict theory because of its strengths in addressing social, political and economic aspects of a conflict. The study targeted the entire adult population in Kuresoi North Sub-county. The research used purposive sampling technique and a sample of a hundred respondents comprising fifty six IDPs, twenty elders, seven chiefs, five police officers, two teachers, one medical officer, four councilors, two representatives from religious organizations and three representatives from NGOs. Interview guides were used to get information from the respondents. The data collected was analyzed inductively; entailing organizing, transcribing, coding, categorizing, and developing concepts and themes which
resulted to narrative structures relating to motives, patterns and consequences aspect of the study. The study has argued that the motives for internal displacement were competition for political power, perceived arrogance of migrant communities, injustices over land, competition for economic opportunities, conduct of ECK, and the culture of impunity. Patterns of internal displacements in the period between 1992 and 2008 started with heightened political activities, planning of attacks and actual attacks. The study argues that the ethnic violence led to deaths, financial burdens of treating the victims, destruction of properties, and deterioration of inter-ethnic relations. It also led to termination of joint initiation ceremonies, rise of Mungiki, disruption of education, family values and agricultural activities. The study recommends stern action against politicians for hate speech and ethnic incitements. On historical grievances over land rights in the study area, the National Land Commission needs to move with speed and address the problem. Other recommendations are; creation of job opportunities, adoption of reconciliation and memorialization approaches in dealing with poor ethnic relations, as well as faithful implementation of IDP Act, 2013 which offers durable solution to internal displacement in Kenya.

THE TRANSFORMATION OF AN AFRICAN RELIGIOUS MOVEMENT:
A CASE OF THE AKURINU OF KANDARA SUB-COUNTY IN MURANG’A COUNTY, KENYA, 1926-2000

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DR. Lazarus Ngari

This study seeks to investigate the history, practices and transformation of the Akurinu movement, a religious group that emerged in Kandara sub-County, Murang’a County in Central Kenya in the 1920s. Its emergence was as a response to the socio-economic, political, and religio-cultural conflict caused by British colonial administration and the teachings of western Christian Missionaries in Gikuyuland. In the colonial period the Akurinu movement became withdrawn from the society and rejected everything that was foreign except the Bible. They adopted an adamant non-cooperation attitude not only to the Europeans but also to fellow Africans. After independence, the Akurinu community adapted themselves to the changing circumstances by initiating transformational changes which boosted their public image, social interactions and upward economic mobility. The study employed theoretical frameworks of Social Movement and Modernization theories with a view to analyze the group’s emergence and the transformational process undertaken. The study covered the period between 1926 and 2000. The study was conducted in Kandara sub-county and covered areas that had large following of the Akurinu under the Kenya Foundation of the Prophets Church. These included Kaguthi, Gathugu, Rwathia as well as Mukurwe and Gacharage. Both secondary and primary data was used. A total of 64 informants both men and women of varying ages were interviewed. Collected data was analyzed through qualitative method, placed under historical interrogation and compared with existing information for authentication purposes. This research established that the emergence of the Akurinu movement was a result of a combination of political, socio-economic and cultural factors in colonial Kenya. The study also established that this movement had undertaken transformations that have impacted positively to the Akurinu way of life in the larger society.

WOMEN COLLECTIVE ACTIONS AND PERFORMANCE OF THEIR INFORMAL GROUPS: ANALYSIS OF ROTATING SAVINGS AND CREDIT ASSOCIATIONS IN MUTHARA DIVISION, KENYA
This study examined Rotating Savings and Credit Associations’ (ROSCAs) socio-economic benefits to members who overcame the collective action challenges to significantly achieve ROSCA goals in Muthara Division Meru County, Kenya. The study objectives were to outline factors influencing women membership into ROSCAs; assess social economic benefits of ROSCAs that improve economic performance of women participants; determine opportunities and challenges affecting performance of ROSCAs and establish the influence of management practices on performance of ROSCAs in Muthara division of Meru County. The study adopted a descriptive design and was done in Muthara Division of Meru County. The target population was 7619 ROSCA members from 176 registered ROSCAs. ROSCA groups were stratified into four categories and stratified random sampling technique was used to select 18 groups which had been in existence for more than two years. Using Cochran’s correction formula, 171 respondents were selected from 18 ROSCAs using stratified random sampling method to participate in the study. Questionnaires were administered to ROSCA members while interview schedules were administered to ROSCA officials and registrar of social welfare groups in Muthara Division. The coded data was analysed using a programme developed by Statistical Package for Social Science (SPSS). The analysis of study findings supported the conclusions that: Providing timely feedback to members influenced economic performance of groups; Women joined ROSCAs to accumulate income to cater for their family needs in education, medical and other emergencies. ROSCAs are platforms for initiating group projects like chicken rearing, outside catering, renting out utensils
to organised ceremonies. There was a good ROSCAs management and performance like organised group’s financial records, meeting attendance registers and ‘pot’ receiving records. Chi square model established a positive association between ROSCA management practices and its performance. However, ROSCAs rarely consulted registrar of social services about investment projects in their locality. ROSCAs faced various challenges including failure by members to honour their obligations like paying group subscription fees hence a need to improve the management of ROSCAs. The study recommends that: ROSCAs adopt technologies of using M-pesa, M-Shwari, and Airtel money among others to make it convenient to save ones income; ROSCAs have links to banks to have a strong capital base; ROSCAs work closer with both County and national government departments on training of ROSCA members by organizing seminars and workshops on prudent management of funds and ways of exploiting unexploited business ventures. Finally, the study recommends that future researches be carried out on the following: first, a cost benefits analysis on socio-economic benefits enjoyed by ROSCAs members in urban versus rural areas. Secondly, a comparative study on prudent ROSCA management skills and techniques in urban and extensive rural areas where there is diversity in membership.
ROLE OF INDIGENOUS KNOWLEDGE IN SEASONAL CLIMATE FORECAST FOR AGRICULTURAL PRODUCTION IN BUNGOMA CENTRAL SUB- COUNTY, BUNGOMA COUNTY, KENYA

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Dr. George L. Makokha

Indigenous knowledge is the local knowledge unique to a given culture or society. It is the basis of decision making in agriculture, healthcare, food preservation and natural resource management. This study was set to establish the existence of Indigenous knowledge in the community of Chwele and Mukuyuni wards of Bungoma Central Sub-County, Bungoma County and its role in seasonal climate forecast. The general objective of this study was to examine the role of indigenous knowledge in seasonal climate forecast for agricultural production in Chwele and Mukuyuni wards. The specific objectives were: (a) To identify and document IK indicators used in forecasting weather in the study area and how the forecast is received and used by farmers, (b) to evaluate farmers’ perception of both scientific and indigenous knowledge forecast in improving agricultural production and (c) to examine socio-economic factors influencing the use of the forecasts for agricultural production. Data collection was done using questionnaires, key informant interviews and focus group discussions. The study employed a descriptive survey design which involved the use of both quantitative and qualitative techniques. The study was stratified into six sub-locations; each was allocated the number of respondents that were to be drawn from it proportionately; according to its total number of farmer households. A list of all farmer households in all sub-locations was sought and random sampling was executed. Using ballot method all required respondents were drawn. Questionnaires were administered to 100 respondents to achieve the three objectives. 5 key informants were included for the interviews and two focus group discussions of 8 members each gave additional information on these three objectives. Scientific forecast on rainfall in the study area for the last 4 years was assembled from Bungoma water supply station and comparison made with the IK forecast as given by the key informants who use IK to forecast weather, the year of reference was 2013 and their previous experiences. Field survey data was analyzed by SPSS, presented and the hypotheses tested by chi-square and factor analysis. The findings revealed that the community relied on IK for seasonal forecast as shown by chi square test p> .05. Moreover, farmers’ knowledge of birds, insects, animals, plants, wind and astronomical indicators was used to predict weather. It was also evident that over 70% of the respondents in Chwele and Mukuyuni Wards access scientific forecasts and their main sources are radio and neighbors. Of those who access the scientific forecasts, only 30% have confidence in it. 75% rate forecast to be useful despite their lack of confidence. The farmers perceived that indigenous knowledge indicators were accurate and reliable in their forecast compared to the scientific forecasts which they termed as unreliable and untimely. It was established that uncertainties about seasonal forecasts was one of the critical factors that forced farmers to continue using IK. It was clear that farmers’ socio-economic status may impede or enhance the use of forecasts. Factor analysis was used to reduce the factors
mentioned, and only 5 were extracted as having significant influence to forecast use. It is recommended that IK should be used to augment scientific forecast to enhance credibility and usability of these forecasts. Scientific forecast should be downscaled to farmer accompanied with advice on how the forecast should be used to enhance their coping strategies. Farmers should also be provided with farm inputs in order for them to take advantage of a good season or avert risks in a poor season. It is suggested that further research on IK in the study area should be done in all aspects of environmental issues where IK is used, a study to establish the rational of IK indicators used should also be carried out and gender involvement in forecast application should be investigated.

DETERMINANTS OF SUSTAINABILITY OF WOMEN'S DEVELOPMENT PROJECTS FUNDED BY NON-GOVERNMENTAL ORGANIZATIONS KISUMU CENTRAL, KENYA

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Although NGOs and other donor agencies play a crucial role in supporting development projects some development projects are not sustained and mostly collapse shortly after withdrawal of donor support. Out of this concern, this study focused on the determinants of sustainability of the development projects funded by NGOs. The study focused on the development project in Kisumu central sub-county, Kenya. The objectives that guided the study were: to investigate the categories of activities within the women development projects funded by NGOs, identify challenges faced by women development projects funded by NGOs and identify strategies put in place by the NGOs for upholding sustainability of women’s development projects funded by the NGOs in Kisumu central sub-county. The study was guided by two theories, institutional theory advanced by Scot (2004) and economic theory by Meyer, (1983). The study used the descriptive design approach. The total number of registered NGOs in the sub-county was 50 but WIFIP
(women in the fishing industry) and K-MET (Kenya Medical Trust Fund) were purposively sampled since they specifically fund women development projects. The total number of projects funded by K-MET were 15 whereas in WIFIP they were 12, using systematic random sampling, the 17 and 12 third projects were selected giving a total of 4 projects funded by K-MET and 3 funded by WIFIP giving a total of 7 projects. From all the projects there were 500 beneficiaries. Nineteen percent was computed giving a total of 96 respondents. This was used to form 12 focus group discussions (FGDs) comprising eight members per project. Six project leaders from WIFIP and 7 from K-MET, 5 finance managers from WIFIP were also chosen while from K-MET there were 7 selected. Officer in charge from the ministry of gender and social service and the regional NGO coordinators were purposefully selected as key informants. Research instruments for data collection were questionnaires for project coordinators from the two NGOs, focus group discussion guide for the women beneficiaries from the selected projects and an interview guide for government official. Observation was also done in the course of data collection mostly to confirm some of the information gathered during interviews. Data analysis was done using statistical package for social sciences (SPSS) whereby descriptive statistics such as frequency and percentages were computed. The study findings revealed that beneficiaries’ involvement, training on project management and stakeholder need analysis are key in sustainability of women development projects. The study recommends that the county government should come up with programs that can help women generate funds without collaterals. The county government in conjunction with the ministry of Gender, Children and Social Services should create women specific ‘Kiti’ which can lend money to women at affordable interest rates. The NGOs should be encouraged to involve the stake holders at all stages of project development. The government in collaborations with non-government organizations should work in close partnership to develop a training package on issues of gender balance putting more emphasis on practical; gender needs and strategic gender wants which hinder them from participating fully in the development process as this affects the sustainability of the funded projects.
This study aimed at establishing demographic and spatial-temporal dimensions of marital instability among women in the rural areas and its effects on their family livelihoods. The study adapted a case study design in which through simple random sampling, one Division was randomly selected in each of the three sampled Districts in Machakos County. Purposive and snowball sampling methods were used to sample the respondents. In total, the sample constituted of 300 women aged between 15-49 years who were separated, divorced or deserted by their husbands. Primary data were collected from the field using questionnaires, Focus Group Discussions (FGD’s) and Key Informants. The information was supplemented by secondary data from library and Internet. The collected data were edited, coded and then subjected to descriptive analysis, and inferential statistical analysis using Chi-square test ($\chi^2$), correlation analysis, and logistic regression among other statistical tools. Results indicate that, out of the sampled women, 78% were separated, 11.3% deserted, and 9.4% divorced while 1.3% had filed for divorce. The separation rate was found to decrease with increase in age while desertion and divorce rates increased with increase in age. Results indicate that, women’s ($p=0.038$) and husbands ($p=0.0001$) age at marriage influenced marital instability. The median age at marriage of this group of women is 19 years; their mean duration of marriage and age at separation is 7.5 years and 26.6 years, respectively. The odds of separating increased by 51% and 80% for women who had 2-3 or more than 3 children, respectively. The odds reduced by 71% and 67% for those who courted for less than 1 year and 1-2 years respectively. Irresponsibility (74%) and infidelity (51.3%) were found to be the leading factors influencing marital instability. Violence (42.3%), alcoholism (38.7%), in law problems (24%), unemployment (11%), age difference (10%), and polygamy (10%) were the other cited reasons. Family background factors such as father education ($p=0.040$) and occupation ($p=0.020$), parents’ marital status ($p=0.005$) and approval of marriage by the parents ($p=0.018$) highly influenced the rate of marital instability. The rate was also high among women with low level of education while cohabitation was found to be insignificant. Place of resident before and after marriage showed significant ($p=0.016$) association with marital instability. Results on domestic assaults in particular sexual abuse in marriage appear to be more of a reaction from other problems in marriage just as it is physical assaults and alcoholism. There was a strong association between physical assaults and forced sex ($0.788$). Results and data analysis further indicate that, most of the separated mothers are faced with challenges of achieving and maintaining their livelihoods due to financial hardships.
About 89.3% lack shared parenting with their former husbands; 68.3% lack economic support from their relatives, government and NGO’s. This increases their vulnerability to poverty. Majority rely on casual jobs (44.7%) or are self-employed (42.7%). They live in rented houses (61%), or with relatives (29.7%). Most of them (93%) are left with young children aged below 12 years at the time of separation. Poverty affects their children as depicted by the high rates of school dropouts in primary (21%) and secondary (9.7%) and also increased use of child labour in the region. From the research findings, it was recommended that, there is need for the Kenyan Government, the County Governments and NGO’s through the relevant department offices to sensitize the public about the causes and outcomes of family conflicts and to address the root cause of child labour, create livelihood opportunities and poverty reduction schemes for separated/divorced parents in the rural areas. These recommendations will improve livelihoods and reduce poverty especially among the affected female headed households in the rural areas.

WOMEN’S PERCEPTION OF ENDOGENOUS FACTORS INFLUENCING THEM TO STAY IN ABUSIVE SPOUSAL RELATIONSHIPS: A CASE OF WOMEN RIGHTS AWARENESS PROGRAM IN NAIROBI COUNTY, KENYA.

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Supervisors: Dr. Merecia Sirera
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The decision whether to stay or end abuse in an intimate relationship is a complex one for victims. Most past studies have focused on socioeconomic factors influencing women to stay in abusive spousal relationships and the interventions addressing the factors. However, statistics indicate that a great number of women continue to stay in their abusive relations jeopardizing their wellbeing and that of their families. Few studies have been done to explore the internal
psychological (endogenous) factors and how women could be helped to free themselves from such abusive marriages. Using the Cycle of Violence and Psychological Entrapment theories, this study explored the women’s perception of endogenous factors that influence their stay decisions. The study used a Phenomenological research design. The target population was women who were in abusive spousal relationships and those that had resolved their abusive situations (survivors). The sample size was thirty (30) women; twenty were selected purposively from Women Rights Awareness Program (WRAP); a shelter for abused women in Nairobi County, and ten survivors of spousal abuse were selected through snowball sampling from Embakasi Subcounty. Data were collected by use of an in depth semi-structured interview schedule, focused group discussions, participant observation and field notes and triangulated to provide a thick description of the findings. Qualitative data were analyzed thematically by use of interpretative phenomenological analysis and presented in verbatim. Quantitative data were analyzed using descriptive statistics and presented by use of proportions, frequency tables and percentages. The findings revealed that women together with their children experienced multiple, severe and chronic physical, psychological, economic and sexual violations which had led to adverse psychological effects that rendered women helpless and contributed to their entrapment in abusive marriages. The study revealed that beliefs such as; need for identity, marriage is permanent, need for father figure, abuse is normal and feelings such as hope that the abuser would change and love for the abuser coupled with coping mechanisms characterized by denial, rationalization of abuse, avoidance and keeping oneself busy influenced women’s stay decisions. Based on the findings from the survivors, the study revealed that women could be helped to reappraise the endogenous factors leading to new beliefs, thoughts and feelings appropriate for resolving spousal abuse. This could be achieved through conceptualizing resolutions to abusive relations from the Transtheoretical Model of behaviour change and addressed through Rational Emotive Behaviour Therapy. The process of resolution of abuse needs to incorporate men for the stability of the family unit and the children for holistic healing and functioning of the society. The findings may provide empirical evidence useful in prioritizing interventions for helping abused women deal with their perception of endogenous factors that maintain abusive spousal relationships.

THE GENESIS, DEVELOPMENT AND IMPACT OF CATTLE RUSTLING IN TESO SUB-REGION, 1600-2001: A CASE OF KATAKWI DISTRICT, UGANDA.

JOHN AMODOI OKOBOI – Ph.D

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Supervisors: Prof. Samson Omwoyo

Dr. Pius W. Kakai
This study examined the genesis, development and impact of cattle rustling in Teso sub-region in the period 1600-2001. It analysed the early history of the Iteso, origins of cattle rustling, the causes of cattle rustling, the changing dimensions of cattle rustling and the impact of cattle rustling on the people of Katakwi district. A case of Katakwi district was taken because of its proximity to Karamoja sub-region where the rustlers came from. In analysing the genesis, development and impact of cattle rustling in Teso sub-region, the theories of social conflict, ecological and materialist paradigms were applicable. The study considered cattle rustling as a form of conflict brought about by ecological factors and materialist gains. The descriptive survey research design was applicable in the study because the information collected from respondents, archives and secondary sources was analysed as regards the genesis, development and impact of cattle rustling in Teso sub-region. The study revealed that the Iteso and the Karimojong originated from South West Abyssinia (Ethiopia) where they had once lived together as pastoralists. The two communities migrated into Karamoja where they separated in about 1620s. The study found that the separation of the Iteso and Karimojong partly contributed to stealing of Teso cattle by the Karimojong because the Iteso had moved with the cattle from Karamoja. The burning of the carcasses of the Karimojong captured cattle in 1952 largely sparked cattle rustling in Katakwi district as a way of revenge. The acquisition of modern weapons (machine guns) escalated cattle rustling especially in the 1980s. This changing dimension from using traditional weapons (spears, bows and arrows, clubs) to modern ones adversely affected the socio-economic and political development in the area of study. Though cattle rustling had been brought about by ecological disparities between Teso and Karamoja sub-regions thereby leading to conflict, this was overshadowed by materialist gain in the post-independence period. The study is significant as it contributes to the growing historiography of cattle rustling within the East African region and Uganda specifically. The study is also significant to the policy makers who cherish the value of peace and living in harmony in North-Eastern Uganda, Uganda as a whole and East Africa in general.

HOLISTIC CHRISTIAN EDUCATION FOR CHARACTER FORMATION IN SEVENTH-DAY ADVENTIST CHURCH-SPONSORED SECONDARY SCHOOLS IN NYAMIRA COUNTY, KENYA

NYABWARI, BERNARD GECHIKO – Ph.D

Department: Philosophy and Religious Studies

Supervisors: Dr. Michael T. Katola

Dr. Zacharia W. Samita
This study examined holistic Christian education for character formation in the Seventh-day Adventist (SDA) church-sponsored secondary schools in Nyamira County. Specifically, it explored the church’s holistic Christian education curriculum, assessed its implementation strategies and examined challenges faced in its implementation. The study employed a descriptive research design. Data were collected from Ekerenyo, Nyamira, Borabu, Rigoma and Marani Sub-Counties which constitute the Nyamira Conference (NC) of the SDA church. Questionnaires, oral interviews, focus group discussions, participant observations and analysis of documents from libraries were used to collect data. A total of 974 questionnaires and 119 respondents interviewed were obtained from the 51 sampled schools. The overall data were collected, analyzed, interpreted and discussed in the light of Miller’s (1998) Holistic Curriculum Theory which suggests six competencies which test holistic education. Research findings revealed that the SDA church offered the holistic Christian education which sought to produce balanced students. Further, it was established that the government of Kenya (GoK) in 1968 directed the Ministry of Education (MoE) curriculum to offer technical education which was opposed by the missionary churches, claiming that it was not holistic. Consequently, the GoK gave the Church the role of sponsor with permission to uphold their beliefs and programmes in the schools alongside the MoE curriculum. The SDA church was one of the churches in Kenya which took management of schools as the sponsor. The NC had 68 sponsored secondary schools. In the schools, the church implemented her educational curriculum through six main approaches. The first approach was the spiritual character formation. To form the students’ spiritual character, Bible study, Sabbath school, mid-week prayer, week of prayer and annual camp meeting programmes took precedence. Second, was the physical character formation. Activities such as work programme, manual work, nature walk and physical activities and games were offered to enhance physical competencies. Third, emotional character formation. Adventist Youth Society, community service, outreach Sabbaths and student rallies programmes developed students emotionally. Fourth, intellectual character formation. Programmes which augmented intellectual competencies included student choir, Bible drills, home health education, arts, crafts, design, creative writing and debating. Fifth, social character formation. Interactive programmes such as sharing talents and skills, students’ camporees, pathfinder clubs and inter-house tournaments furnished students with proficiencies for social fitness. Finally, moral character formation. For students to achieve the moral competencies the schools upheld human reproductive health and safety education, responsiveness of the consequences of female circumcision, gender awareness and equality programmes. In spite of the NC provision of holistic Christian education curriculum ills were exposed which indicated that the objectives of the holistic Christian education curriculum were not fully accomplished. The study established that seminars on the relevance of holistic education were missing, schools did not allocate enough funds for the programmes, there were pressure from the public curriculum, most programmes were not implemented and the chaplains to interpret the church’s holistic education curriculum were not professionally trained. Recommendations were made to the government, churches and schools to ensure that holistic Christian education was fully implemented in order to reduce the ills in schools.
DIFFICULTÉS LIÉES À LA PRONONCIATION DU FRANÇAIS AU KENYA : LE CAS DES APPRENANTS DES ÉCOLES SECONDAIRES DES COMTÉS DE NAIROBI ET BUNGOMA

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Department: Foreign Languages

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Dr. Vincent Otaba Were

Research shows that speech work is a commonly neglected aspect in the teaching of French as a foreign language in spite of difficulties experienced by learners in this linguistic area. Over the last ten years, the Kenya National Examination Council (KNEC) has in its annual reports pointed out numerous articulation challenges on the part of candidates having sat the Kenya National Certificate of Secondary Education (KCSE) French oral examinations. It is against this background that this study sought to examine pronunciation difficulties on the part of secondary school learners of French in Kenya. The relevant data was collected from thirty secondary schools systematically and conveniently sampled from the Counties of Nairobi and Bungoma. As such, the study sample comprised recordings of topical exposés by 90 students of French in fourth form during the year 2015, three series of text books used in the teaching of French in Kenyan secondary schools, and responses to a questionnaire addressed to 30 teachers of French. The recorded expositions were analyzed by Error Analysis and the text books subjected to a speech work-based content analysis. The data collected was descriptively presented by use of frequencies and percentages in the form of tables and graphs. The set hypotheses were tested by use of SPSS aided statistical tests namely Chi-square and T-test. The results of the study showed that majority of pronunciation errors in the learners’ speech were intra-lingual in nature. It also emerged that the learning resources analyzed were not appropriate to solve the above stated problem. Finally, The study seems to show that the key challenges compromising the teaching of speech work in French were scarcity of suitable teaching and learning materials, incompetence on the part of teachers and time-related constrains. In the light of these challenges, the study recommends the review of existing resource materials, capacity building for teachers of French on pronunciation and the teaching of the same, and finally, a curriculum review to increase the time allocated to the teaching of foreign languages. It is hoped that the findings and recommendations of this study will shape and improve actions by concerned stakeholders in Kenya namely students and teachers of French, teacher trainers, policy makers as well as researchers in this field.
The emergence of bacterial resistance to existing antibiotics and other drugs is a worldwide problem. New classes of antimicrobial compounds with complete new mode of action are therefore urgently needed to control the rise of the multidrug resistant pathogens. The objective of this study was to prepare, and characterize half-sandwich organometallic compounds of iron containing amine ligands with similar backbones as drug molecules used in the treatment of TB and to test their biological activities against selected bacteria. Half-sandwich organometallic complexes of the type \[\{(\eta_5\text{-C}_5\text{H}_5)\text{Fe(CO)(PPh}_3)\}_2\mu-(\text{L})\text{X}_2\] (L = 1,2-diaminoethane, 1,3-diaminopropane and 1,4-diaminobenzene, \(X\) = univalent counter-anion such as BF\(_4\)-) were synthesized by reacting two equivalents of \[\{(\eta_5\text{-C}_5\text{H}_5)\text{Fe(CO)(PPh}_3)\}(\text{THF})\text{BF}_4\] with L in dichloromethane. The complexes were isolated by precipitation using hexane as air-stable compounds which were then recrystallized and characterized by FTIR and NMR, spectroscopy, melting point determinations and elemental analysis. The characterized compounds were then subjected to \textit{in vitro} bioassays to determine antibacterial activities against selected bacteria by agar disc diffusion method against \textit{Pseudomonas aeruginosa}, \textit{Bacillus subtilis}, \textit{Escherichia coli} and \textit{Staphylococcus aureus} with gentamicin as the positive control and 0.1% DMSO as the negative control. The organometallic complexes were found to be potent antibacterial agents. Their minimum inhibitory concentrations were determined through broth micro-dilution technique and found to inhibit the growth of the bacteria used when at as low concentrations as 6.25mg/ml for L = 1,2-diaminoethane, and 1,3-diaminopropane complexes. They indicated that the complexes (ethylenediamine and propylenediamine complexes), which mimicked ethambutol, were more active against all the bacteria used for this study. The paraphenelenediamine complex was found to have little activity against the bacteria used in this study.
ANTIPYRETIC, ANTIINFLAMMATORY AND ANTINOCICEPTIVE ACTIVITIES OF FOUR SELECTED KENYAN MEDICINAL PLANTS IN MICE MODELS

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Dr. George Orinda

Acacia nilotica, Urtica dioica, Aloe volkensii and Cynanchum viminale have been used to manage several diseases including pain, inflammation and fever. However, their efficacy has not been scientifically validated. The aim of this study therefore is to investigate the antinociceptive, antipyretic and anti-inflammatory activities of their aqueous extracts. The plant materials were collected from Loita division, Narok County in Kenya. A total of 240 albino mice with an average weight of 20g were used for this study. Antinociceptive activity was determined by use of formalin−induced writhing test. A writh was recorded by a stopwatch following the stretching of the abdomen and/or stretching of at least one hind limb. A total of 15 groups with 5 mice per group were considered for determination of antinociceptive activity. Diclofenac was administered as the reference drug. Anti-inflammatory activity was established by a formalin induced inflammation test. Hourly changes in paw sizes and reduction of edema around the paw was determined using a vernier calipers for five hours after extract and drug administration. A total of 15 groups with 5 mice per group were considered for determination of anti-inflammatory activity. Diclofenac was used as the reference drug. Antipyretic activity was carried out using Brewer’s yeast induced pyrexia. Temperatures of each mouse was then determined by thermal probe thermometer rectally at hourly interval for three hours after extract and drug administration. A total of 15 groups with 6 mice per group were considered for determination of antipyretic activity. The positive control group was treated with paracetamol at a dose of 150 mg/kg body weight. The aqueous extracts of Acacia nilotica, Aloe volkensii, Cynanchum viminale and Urtica dioica reduced pain, inflammation and fever mostly at dose 150 mg/kg body weight. Based on these findings it was concluded that the present study has demonstrated the antinociceptive, anti-inflammatory and antipyretic potential of aqueous extracts of Acacia nilotica, Aloe volkensii, Cynanchum viminale and Urtica dioica in albino mice. It will therefore serve as a good bio-resource for generating readily available herbal formulations that are more effective in the treatment of pain, inflammation and fever.
ABUNDANCE, GENETIC DIVERSITY AND SYMBIOTIC POTENTIAL OF COMMON BEAN (*Phaseolus vulgaris* L.) NODULE ASSOCIATED BACTERIA IN WESTERN KENYA SOILS

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Plant growth-promoting rhizobacteria (PGPR) are beneficial native soil bacteria that colonize plant roots and result in increased plant growth. Those that colonise the nodules of legumes are known as nodule associated bacteria (NAB). The aim of this study was to determine the distribution and genetic diversity of NAB that colonize *Phaseolus vulgaris*, their abundance, and symbiotic efficiency when coinoculated with *Phaseolus vulgaris* in Western Kenya soils. The soil samples were collected from cultivated lands in Kisumu near Lake Victoria, slopes of Mt. Elgon and Kakamega. In each of these regions, the soil samples were collected from four regions. 1ml of soil solution at 10 fold dilution for seven dilution steps (10-1 to 10-7) and three replications for each dilution was used to inoculate common bean seedling in Leonard jars. They were harvested after four weeks to determine abundance of NAB using most probable number method. Common bean nodules were also collected directly from the farmers’ farms in the above three regions. Harvested nodules and those collected from the field were cleaned and surface sterilized, crushed and exudates streaked on YEM agar growth media. Pure colonies were further cultured in YEM broth at 280C for three days and the genomic DNA isolated from the bacteria using Qiagen DNA extraction kit. 16SrRNA gene was amplified by 27F and 1492R primers and PCR products resolved by agarose gel electrophoresis and sequenced. 16SrRNA gene analysis revealed that NAB that nodulate with common beans are genetically diverse as they formed clusters on the phylogenetic tree and their distribution depends on chemical characteristics of the soil. BLASTn showered that isolated strains belonged to the genus *Pseudomonas, Providencia, Rhizobia, Klebsiella, Sphingobacterium, Enterobacter, Delfitia, Acinetobacter* and one strain did not have sequence homology at the GenBank. Mt. Elgon region had the highest population of NAB (120000 cells per gram of the soil), followed by Kisumu (1290 cells per gram of the soil) and Kakamega region had the lowest (17 cells per gram of the soil). The effect of PGPR on the yield of common beans was significantly higher (*p* < 0.001) when co-inoculated with *Rhizobia* compared to the yield of *Rhizobia* inoculated alone or control (not inoculated) (*p* < 0.05). This study therefore provides knowledge on the type of NAB that nodulates with common beans and factors that favour their distribution necessary for production of PGPR inoculants suitable to the soils of Western Kenya.
ANTIMICROBIAL ACTIVITY AND QUALITATIVE PHYTOCHEMICAL COMPOSITION OF CRUDE EXTRACTS FROM MEDICINAL PLANTS AGAINST SELECTED ENTERIC BACTERIAL PATHOGENS AND *Candida albicans*

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Plant extracts with medicinal value have been used to treat many diseases that can either be bacterial, fungal or parasitic among many others. Plants with medicinal value produce certain chemical elements known as phytochemicals that have antimicrobial activity. Enteric bacterial pathogens are disease-causing microorganisms that are usually located in the intestinal tracts of either animal or human beings. The pathogenic members are usually associated with infections that are characterized by; enteric fevers, abdominal pain, diarrhoea, and vomiting. *Candida albicans* is a yeast fungus that is mainly found in the mucosal cavity of the vagina and intestinal tract as a normal microbiota but it can cause systematic infections in immunocompromised individuals. This study was aimed at determining the antimicrobial activity, combined effects of the selected plant leaf extracts of *Tagetes minuta*, *Aloe secundiflora*, *Vernonia lasiopus* and *Bulbine frutescens* against selected clinical isolates of *Escherichia coli*, *Salmonella typhi*, *Staphylococcus aureus*, *Shigella flexineri*, *Enterococcus faecalis* and *Candida albicans* obtained from Kenyatta University Health Centre; using the Kirby-Bauer method. In addition, qualitative analysis of the phytochemicals present in the extracts was also determined. The plants materials were obtained from Kenyatta University arboretum and identified by Taxonomist; Prof L.E. Newton and voucher specimen deposited in the University herbarium. The collected data was then analyzed in SAS version 9.1 using ANOVA and further subjected to a post hoc test with P<0.05 being considered significant. When used singly and in combinations against the test microorganisms the average zones of inhibition were found to be significant at P<0.05. When the plant extracts were used in low concentrations against the test microorganisms; *Vernonia lasiopus* was more active against *Shigella flexineri* (MIC 3.3µg/ml, MBC 7.1µg/ml), *Bulbine frutescens* against *Shigella flexineri* (MIC 3.2µg/ml, MBC 6.2µg/ml), *Aloe secundiflora* against *Shigella flexineri* (MIC 3.7µg/ml, MBC 8.0µg/ml) and *Tagetes minuta* against *Enterococcus*
faecalis (MIC 5.1µg/ml, MBC 6.3µg/ml)*. The combining of the extracts also showed an increased and decreased antimicrobial activity with the interactions being significant; P<0.05. The average zone of inhibition formed by Aloe secundiflora and Tagetes minuta plant leaf extracts combination (8.67±1.86mm) showed a decrease in antimicrobial activity as compared to when Tagetes minuta (15.17±2.71mm) and Aloe secundiflora (17.00±2.10mm) respectively when used against Candida albicans. The qualitative phytochemical analysis showed the presence of four phytochemicals; saponins, tannins, alkaloids, and flavonoids. The study provides insight into the antimicrobial activities of the plant extracts and their use in the treatment of bacterial or fungal infections. This information might be used in herbal medicine in making concoctions to maximize their effectiveness. There is a need to elucidate the actual compounds in the plant leaf extracts responsible for the antimicrobial activity so that can be used in drug development

ANTIBACTERIAL, ANTIFUNGAL AND PHYTOCHEMICAL SCREENING OF THE PLANT SPECIES Lannea schweinfurthii (ENGL.) ENGL.

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Herbal medicine has been widely used and forms an integral part of primary health care in most countries. Of late, despite emphasis being put in research of synthetic drugs; interest in medicinal plants has been reborn. This is due to the rapidly growing population, the failure of modern medicine to provide effective treatment, increase in chronic diseases and the emergence of the multi-drug resistant pathogens. It is of importance to establish a scientific basis for the use and validation of medicinal plants through biological screening. Phytochemicals are currently receiving more attention due to their effectiveness in the treatment of infectious diseases as well as mitigating many of the side effects caused by conventional antimicrobials. Pharmacological studies of Lannea schweinfurthii (Engl.) Engl. has revealed antimicrobial property of the plant but very little has been reported about the active ingredients in the plant. In this study the stem bark of L. schweinfurthii (Engl.) Engl. was collected, air-dried and ground into a fine powder. Sequential extraction was done with hexane, dichloromethane (DCM), ethyl acetate (EtOAc) and methanol (MeOH). The crude extracts were subjected to bioassay screening for their antibacterial activity against selected strains of bacteria, including Gram-positive Staphylococcus aureus and Bacillus subtillis and Gram-negative Pseudomonas aeruginosa and Escherichia coli and antifungal activities against Candida albicans. Moderate and high activities, ranging from 11 to 21 mm inhibition zones, were observed for EtOAc and MeOH crude extracts against the microbes used except P. aeruginosa. Hexane and DCM crude extracts showed mild activity of 7 mm. Tetracycline and nystatin used as positive controls for bacteria and fungi, respectively had inhibition zones of 18 mm. GC-MS analysis was done on the crude DCM and MeOH extracts to give a preliminary idea of the class of compounds in the plant species. The spectral data obtained from the crude DCM and MeOH extracts indicated presence of phenolic compounds, fatty acids and their derivatives, terpenoids, polyketide derivatives and steroids in the plant. Purification of crude extracts was carried out using solvent partition and
chromatography: CC, VLC and PTLC. Structural elucidation and characterization was done using standard spectroscopic methods (1H NMR, 13C NMR, DEPT and COSY). The combined hexane/DCM extract yielded two compounds namely; 3-(10'-tridecenyl) phenol (LS01) and di-(2’-ethylhexyl) ester phthalic acid (LS05). Ethyl acetate extract gave three compounds namely; lupeol (LS02), β-sitosterol (LS03) and epicatechin (LS04). Bioassay of the isolated compounds was done in which epicatechin (LS04) showed high activity against the Gram-positive bacteria S. aureus and B. subtilis and Gram-negative E. coli, with an inhibition zone of 15, 14 and 10 mm, respectively. Further, epicatechin (LS04) showed an activity of 14 mm against C. albicans. The study has demonstrated that the stem bark of L. schweinfurthii has chemical constituents that are bioactive. Further studies such as cytotoxicity tests should be carried out on the crude extracts and isolated compounds to ascertain reported activity so to use bioactive components either as antimicrobials or as templates in drug synthesis. Furthermore, measures should be put in place to conserve the plant species from extinction.

NUTRIENT INTAKE, DIET SATISFACTION AND NUTRITION STATUS OF ADULT SURGICAL ORTHOPAEDIC PATIENTS ADMITTED AT UNIVERSITY TEACHING HOSPITAL IN LUSAKA, ZAMBIA
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Orthopaedic injuries are common globally with the highest prevalence reported in the sub-Saharan region. In hospitals, malnutrition is a significant problem in both developed and developing countries, its prevalence ranging from 20 – 60%. Malnutrition is reported to be common among orthopaedic patients due to disease, inadequate nutrient intake and low diet satisfaction associated with quality of hospital food. Untreated malnutrition is detrimental to individuals, societies and economies of countries. Despite the high prevalence of malnutrition, the condition is under-diagnosed. There is limited literature
on the nutrient intake, diet satisfaction and nutrition status of adult surgical orthopaedic patients. The purpose of this study was therefore to determine the nutrient intake, diet satisfaction and nutrition status of adult surgical orthopaedic patients admitted at the University Teaching Hospital in Lusaka, Zambia. It was a cross-sectional analytical study that collected both quantitative and qualitative data on a sample of 98 surgical orthopaedic patients. A researcher-administered questionnaire was used to collect data from individual patients. Key informant interviews were conducted with three hospital staff. Anthropometric measurements of mid-upper arm circumference were taken on admission and during data collection. Statistical Package for Social Sciences version 21.0 was used to analyze quantitative data. Nutrient intake data was first analyzed using Nutri-Survey software (2005) based on recommended dietary intakes, then exported to SPSS for further analysis. P-values less than 0.05 were considered statistically significant. The findings on nutrient intake indicated that mean energy, protein, calcium, sodium, iron, zinc, folic acid, dietary fiber and vitamin C intake were all below the recommended values (1,919cal, 61.67g, 160.05mg, 222.91mg, 2.55mg, 22.60mg respectively). Further, 24.4%, 8.5%, 26.7%, 5.5% and 15.2% of the participants met the Recommended Dietary Intakes of energy, protein, iron, vitamin C and dietary fiber respectively. Hospital food contributed more than 60% of the total nutrient intake of energy, protein, folic acid and dietary fiber. With a mean overall satisfaction score of 2.33±0.61, the majority of orthopaedic patients were satisfied with the hospital diet on aspects of portion size, temperature and time of meal distribution (67.3%, 94.9%, and 56.1% respectively), while 76.5%, 96.9%, 71.4% and 65.3% were dissatisfied with the hospital diet on aspects of type, variety, taste and appearance respectively. Majority of the participants had normal nutrition status on admission (86.7%) and during data collection (82.7%). There was a significant difference between mid-upper arm circumference on admission and during data collection (Paired t-test; p<0.001). There was no significant association between nutrient intake of the selected nutrients and nutrition status (MUAC) among adult surgical orthopaedic patients (Pearson correlation; p>0.05), between nutrient intake of the nutrients and diet satisfaction (Pearson correlation; p>0.05) as well as between diet satisfaction and nutrition status (MUAC) (Pearson correlation, p>0.228). In conclusion, the mean consumption intake for all the selected nutrients was below the recommended dietary intakes and the majority of orthopaedic patients were not satisfied with hospital food. It is recommended that the Ministry of Health increase funding towards provision of nutritious meals at the University Teaching Hospital and that routine screening of hospitalized patients for malnutrition be done as standard practice.

GROUNDWATER INVESTIGATION AND CHARACTERISATION IN MARIGAT AREA, BARINGO COUNTY, USING VERTICAL ELECTRICAL SOUNGING RESISTIVITY SURVEYS

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Department: Physics

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Dr. Githiri J. Gitonga
Marigat area, located in Baringo-Bogoria basin is a semi-arid part of the eastern Rift valley experiencing limited supply of potable water. Groundwater in this region is unexploited due to challenges of undefined nature of fault lines and presence of underground geysers. This study was carried out with the aim of investigating the groundwater potential and to characterise water bearing formation in Marigat area, Baringo County using resistivity method. Vertical electrical sounding (VES) method was applied using Schlumberger electrode configuration to determine the vertical variation of resistivity with depth and to delineate probable aquifers that can be developed into productive boreholes. A total of 28 VES points were probed along five Horizontal Electrical Profiles (HEP) within an area of about 19.2 km² using an ABEM SASterrameter 1000/4000. The collected data was analysed using IP2WIN software and Surfer 8 Golden software which revealed the presence of 3-6 interpretable geoelectric layers which were categorized into three inhomogeneous formations corresponding to the existing borehole data within the study area. The first formation is an unsaturated top alluvial deposit with resistivity ranging from 2.49 Ωm to 258 Ωm and thickness ranging from 0.284 m to 44.1 m. The second formation which is slightly weathered and fractured rock has resistivity varying from 0.77 Ωm to 71.5 Ωm while the thickness varies from 4.33 m to 63.2 m. The third formation is characterized by fresh and weathered basement of compact basaltic rock with resistivity values varying from 0.0685 Ωm to 6979 Ωm and thickness ranging from 25.1 m to 52.1 m. Two of the soundings were carried out near existing boreholes in which pumping tests had been carried out. Dar Zarrouk parameters were computed and used to estimate the aquifer hydrologic properties. It was found that the transmissivity values obtained range between 13.569 m²/day – 1429.052 m²/day while the geothermal gradient determined using Salabani borehole data (C6362) was found to be 239.73°C/km. The results of this study shows that groundwater potentials along the sedimentary basin is good for development at shallow depths ranging between 35 m – 50 m located at the mid-central and the stretch towards south east of the study area while the basement rock with low resistivity values and high geothermal gradient is good for geothermal exploration. Based on the geological setting and the resistivity results of this study, it is highly recommended that chemical analysis for potable groundwater should be carried out after drilling in order to ascertain on its quality.

CULTURAL AND BOTANICAL METHODS FOR THE MANAGEMENT OF THRIPS ON FRENCH BEANS *PHASEOLUS VULGARIS*

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French bean is the most important export vegetable crop cultivated in Kenya. Pests and diseases are the major constrains to its production. The major pests of French beans are bean flies, thrips, and bean aphids. Amongst these pests, thrips are the most notorious and account for 63 – 68% yield loss of fresh marketable pods. *Frankliniella occidentalis* is the most widespread thrips species which has developed resistance to the commonly used synthetic pesticides. Farmers rely heavily on these synthetic pesticides in order control the thrips and up to sprays of 15 times have been reported per growing season. This act has lead to the contamination of the fresh French bean pods with pesticide residues. The toxicated fresh pods may not be accepted in lucrative markets, more so in Europe. This study therefore, aimed at developing an alternative method of controlling thrips on French beans by use of cultural and botanicals. Laboratory and greenhouse experiments were conducted in two trials to assess the efficacy of botanicals against *Frankliniella occidentalis* infesting French beans. Field experiments were also conducted in two trials to evaluate the effect of different mulches on infestation and damage of French beans by thrips, and to evaluate the effect of integrating intercropping, mulching and use of botanicals on the infestation and the damage of French beans by thrips. The laboratory and greenhouse experiments were carried out at the International Centre of Insect Physiology and Ecology Nairobi in a complete randomized design. Field experiments were conducted at the Kenya Agricultural and Livestock Research Organization, Thika, Kenya in a randomized complete block design with five replicates for mulching experiments and three replicates for the integrated experiments. The laboratory results showed that L-Cyhalothrin caused the highest mean percentage mortality of the first instar *F. occidentalis* followed by Pyrethrum. Neem and Garlic caused the lowest mean percentage mortality. The result from greenhouse experiments showed that the lowest mean number of thrips was recorded on the French beans sprayed by L – Cyhalothrin followed by pyrethrum (soil + foliar), neem (soil + foliar), neem (soil) pyrethrum(soil), garlic (soil + foliar), garlic (soil) and control. The lowest damage score on fresh pods was recorded on the leaves treated with Pyrethrum (soil + foliar) and neem (soil + foliar) while the highest damage scores were recorded on the French beans treated with garlic (soil) and the control. The result from the experiments involving mulching showed that the lowest mean number of thrips was recorded on French bean leaves and flowers mulched with transparent plastic sheets followed by those mulched with dry grass, black plastic mulch, tithonia green mulch and the control. The results from integrated field experiments revealed that maize + dry grass + pyrethrum had the lowest mean number of thrips in flowers followed coriander + dry grass + pyrethrum, dry grass + pyrethrum, French bean a lone, coriander, pyrethrum and dry grass. In flowers the lowest mean number of thrips from French bean plant sprayed by L-Cyhalothrin followed by maize, maize + dry grass + pyrethrum, coriander + dry grass + pyrethrum and dry grass. The most abundance thrips species identified on French beans leaves was *Hydatothrips adolfifriderici* followed by *Megalurothrips sjostedti* while *Frankliniella*
*schultzei* and *F. occidentalis* were very low in number. On French bean flowers, *F. schultzei* was the most abundance followed by *M. sjostedti* while *F. occidentalis* and *H. adolfifriderici* were very few. This study showed pyrethrum and neem pesticides can be used as an alternative chemical management for *F. occidentalis* on French beans in greenhouses. It also revealed that cultural and botanical methods can be integrated to provide an alternative pest management system. The system involves a combination of pyrethrum + maize + dry grass. However, these methods are not as effective and fast acting as synthetic pesticides, but are safer for the environment and consumers.

**BIOPROSPECTING FOR HYPOGLYCEMIC ACTIVITIES AND SAFETY OF SELECTED TRADITIONALLY USED PLANTS IN THE MANAGEMENT OF DIABETES MELLITUS**

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**Dr. Mathew Piero Ngugi**

Diabetes mellitus is a group of metabolic diseases characterized by high blood sugar levels that result from defects in insulin secretion, or action, or both. The disorder completely throws the metabolism of dietary carbohydrates, lipids and proteins into disarray. This condition in its fully developed form is characterized by high blood sugar level (hyperglycemia), glycosuria, increased protein breakdown, ketosis and acidosis. Diabetes is a chronic medical condition which
can be controlled but lasts a lifetime. Conventional management of diabetes mellitus is expensive and therefore unaffordable and sometimes unavailable to many patients especially in developing and underdeveloped nations. Such antidiabetic drugs have been found to have side effects with long term use and hence facilitating the continued usage of herbal prescriptions as an alternative way to compliment orthodox pharmacotherapy. However, there is limited scientific evidence regarding safety and efficacy to back up the continued therapeutic application of herbal remedies. The aim of this study was to determine through bioassay-guided screening, efficacy and toxic components present in five selected medicinal plants. The following herbs were studied: *Lippia javanica*, *Ocimum lamiifolium*, *Croton macrostachyus*, *Azadirachta indica*, and *Persea americana*. The *in-vivo* antidiabetic activity and safety of these extracts were screened in white male alloxan-induced diabetic albino mice. The aqueous plant extracts were administered orally and intraperitoneally. The safety of these plant extracts were studied by administering 450mg/kg, 670mg/kg and 1000mg/kg body weight orally and intraperitoneally daily for 28 days in mice. The mineral elements of the aqueous plant extracts were analyzed using atomic absorption spectrometry (AAS) and Total Reflection X-ray Fluorescence system (TRXF) while various phytochemicals present were qualitatively assessed using standard procedures. Results revealed antidiabetic activity of the extracts at varying doses of 25, 48.4, 93.5, 180.9 and 350 mg/kg body weight. The extracts decreased the body weight gain and altered the organ to body weight percentage of the brain, kidney, liver, heart, testes and lungs for both intraperitoneal and oral routes. In both routes, administration of the same doses (450mg/kg, 670mg/kg and 1000mg/kg body weight) caused a change in levels of RBC, WBC, Hb, PCV, PLT, MPV, MCV, MCH, MCHC, neutrophils, lymphocytes, eosinophils, basophils, monocytes and biochemical parameters: AST, ALT, GGT, CK, α-AMYL, LDH, T-BIL, D-BIL, I-BIL, TG, TC, LDL-C, HDL-C, BUN, UA, Urea and Creatinine. The extracts contained tannins, flavonoids, saponins, sterols, anthraquinones and alkaloids. Elemental analysis confirmed the presence of Sodium, Chlorine, Potassium, Calcium, Titanium, Vanadium, Mercury, Chromium, Manganese, Iron, Copper, Zinc, Arsenic, Cadmium, Magnesium, Nickel and Lead at levels above or below the recommended daily allowance. In conclusion the results showed that the plant extracts were effective in reducing blood sugar levels the plants showed no toxicity and revealed the presence of vital phytochemicals and elements which posses’ antidiabetic activities. The study therefore, confirmed the traditional use of these herbs and established their safety and efficacy data that can
guide their proper use in the management of diabetes mellitus. Consideration should be made to carry out the same studies using higher animals. Besides, one can subject the plants to organic solvent extraction and compare activities of both aqueous and organic fractions.

GENETIC DIVERSITY AND VIRAL DISEASE RESISTANCE OF THE INDIGENOUS CHICKENS FROM SELECTED AREAS IN KENYA
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Indigenous chickens show extensive physical diversity. However, industrialization and globalization of chicken in the 21st century has affected and limited their genetic resources to industrial breeds. Continuous selection for rapid growth and more egg production has resulted in the loss of disease resistance and overall immuno-competence hence a projected increase in disease-related costs in the future. Genetic control of disease resistance is one of the most important targets of breeding schemes in future. In India a breed of chicken resistant to most viral diseases (kuroiler) has been identified and is being crossed with improved breeds to increase disease resistance. It is not known in Kenya if there exists pockets of poultry with genes of resistance to any of the common diseases that often reduce profitability of poultry industry. It was hypothesized that the Kenyan indigenous chickens have no diversity and potential viral disease resistance genes. This study aimed at obtaining information to facilitate indigenous chicken breeding stock development, to come up with a stock that would be potentially resistant to most common viral diseases. One hundred and fifty indigenous chickens with diverse morphological features were obtained from Kenya especially in areas where it is perceived that no cross with industrial breeds has occurred and kept at InCIP-Egerton University Njoro. Eighteen microsatellite markers were used to study genetic diversity among and within populations. Presence of viral disease resistance genes: Mx1, TVB*R, TVB*S1 and TVB*S3 was investigated. Using GDA software, population genetic indices were characterized. Statistics
related to genetic variation were estimated using GenALEx6. Mean percentage polymorphic loci was 96.71% and 4% AMOVA and PhiPT (fixation index) of 0.042 was seen among the eight ecotypes, p-value of 0.003 at 95% CI. MCW0123 marker had the highest variance of 13% among populations. Mean He ranged from 0.351±0.031 (SIB) to 0.434±0.022 (BM) with a grand mean of 0.399±0.011 obtained across the populations using the SSRs and grand mean He of 0.313±0.023 observed when the SNPs were used. Nei’s genetic distance ranged from 0.016 (SIB/WP) to 0.126 (NR/SIB). DARwin6.501 analysis software was used to draw the population dendrogram and two major population clusters were observed, also seen with PCoA. It also established presence of the viral disease resistance genes: 21.33% having the homozygous A and 58.67%, the heterozygous A/G allele of the Mx1 gene (potential resistance to IAV and NDV). TVB*S3 genotype seen in 24% of the samples show potential resistance to ALVE but not B and D subgroups. Sequencing of the TVB202 amplicons would show clarity of the P4, P5 and P6 possible TVB genotype combinations for strong inference of viral diseases resistance since the XbaI enzyme used failed to restrict the PCR products. Crossing the chicken types with potential resistance to ALVE, IAV and NDV with susceptible ones would enhance survival fitness of the indigenous chickens. These resistant breeds should be selected for breeding purposes.

THE RELATIONSHIP AMONG INJURY, LEUCOCYTE COUNT AND MOLECULAR DIVERSITY OF THEILERIA IN ZEBRA’S IN NAIVASHA-KENYA

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Understanding the interrelationships between injury, infection and diversity of Theileria in a zebra population may illuminate the mechanisms by which injuries influence the course of latent infections, and may be an important factor to be considered during therapy of injured animals. Currently, the molecular diversity of Theileria species that are circulating in Kenyan free living common zebras is unknown and the effect of anthropogenic induced injuries on Theileria diversity and infection patterns are poorly known. Moreover, zebras are considered maintenance or reservoir hosts for Theileria equi infecting domestic equines such as donkeys and horses. The objectives of this study were; to examine and evaluate molecular genetic diversity of Theileria sp infecting injured and healthy free living zebra’s from different localities in Naivasha. Examine the leucocyte differential cell count in injured and healthy zebra. Evaluate the influence of Theileria infection on the leucocyte differential count in zebra. Theileria infecting Zebra was detected and characterized using PCR amplification and sequencing of the 18S ribosomal gene from parasite DNA extracted from host blood. Leucocyte differential of injured and healthy
zebra was examined using microscopy of blood smears. All 81 zebras examined yielded positive PCR results using gel electrophoresis. Seventy-nine clean sequences were obtained and blast results were closely matched *Theileria equi*. There were 3 *Theileria equi* haplotypes circulating among zebra in Naivasha. Haplotype 2 was the most common *Theileria* haplotype infecting zebras with a prevalence of 90.63% in injured animals and 66.67% in non-injured animals. There was genetic differentiation in terms of the frequency of haplotypes infecting injured compared to non-injured Zebra (FST=0.732, P<0.0001). Injured animals had a lower haplotype diversity for *Theileria equi* compared to the non-injured (Haplotype diversity for non-injured =0.533, Injured =0.175). Injured zebras had a higher median percent of neutrophils than non-injured zebras (median neutrophil was 64 and 37 in injured and non-injured respectively, P=0.001). The percent of lymphocytes on the other hand was lower in injured zebras compared to uninjured animals (median was 35 and 53 for injured and not injured respectively, P=0.001). Similarly, the percent of Eosinophils and monocytes were reduced in injured animals compared to non-injured animals (median=0 and 2 for eosinophils and 0 and 2 for monocytes respectively, P=0.001). This study shows a lower genetic diversity of *Theileria equi* infecting zebra compared to other equine populations studies so far. The low genetic diversity is consistent with the low genetic diversity in injured zebra and suggests that the influence of injuries in this population is profound.

**EFFECTS OF SUBSTRATE TEMPERATURE OF WINDOW LAYER ON THE PERFORMANCE OF Sn_xSe_y/ZnO:Al P-N JUNCTION SOLAR CELL**

**JOHN GITONGA MBAE – M.Sc.**

**Department: Physics**

**Supervisors: Dr. Mathew M. Munji**

**Dr. Robinson J. Musembi**

Various elements and compounds have been studied to fabricate thin film semiconductors for the solar cell applications. Apart from the materials used in the cell fabrication, the performance of solar cell also depends on the technique used and deposition parameters.In this research, the performance of the p-n junction solar cell is improved by depositing thin films at optimized deposition temperature. The optical and electrical behavior of thin films was analyzed under varied chemical composition and deposition conditions in order to optimize them for an improved solar cell. Zinc Oxide was doped with various percentages of Aluminum ranging from 0% to 10% by mass. Tin (Sn) and selenium (Se) metal samples were mixed in different ratios of increasing selenium. Deposition of both SnSe and ZnO:Al thin films on glass substrate was done by a method of evaporation using Edwards Auto 306 RF/DC Magnetron evaporation system under the following conditions; deposition temperature 500K, pressure of 3.5×10⁻⁵ millibars and a current of 3.5A. Transmittance and reflectance data in the
range 300nm-1500nm was obtained using a double beam solid spec 3700 UV-VIS-NIR shimadzu spectrophotometer. Scout software was used to analyze the data to determine optical constants of the solar cell. Doping of 5% aluminium and a synthesized ratio of 1:1.0 for ZnO:Al and SnSe thin films respectively was obtained as the optimum values. The optimized Al doped ZnO was deposited at different deposition temperature ranging from 350K-550K. Transmittance percentage in the visible region was used to optimize deposition temperature and 510K was obtained as the optimum value. Band gap energies of optimized ZnO:Al and Sn$_{x}$Se$_{y}$ was found to be 3.61±0.05eV and 1.37±0.05eV respectively. Electrical measurements of the thin films was done by fourpoint probemethodin which measurements were obtained using Keithley 2400 SourceMeter interfaced with a computer using LabView program. The sheet resistivity for SnSe at a temperature of 295K was 22.95±0.05Ωcm while when annealed at 423K, a value of 19.27±0.05Ωcm was obtained. The sheet resistivity for ZnO:Al at room temperature was 32.24 Ωcm. The solar cell had a short circuit current ($I_{sc}$) of 1.122mA/cm$^2$, an open circuit voltage ($V_{oc}$) of 0.61V, fill factor (FF) of 0.67 and conversion efficiency of 0.46% as calculated from the I-V characteristics.

**CHARACTERIZATION OF Sn$_x$Se$_y$ / SnO$_2$-Ni PREPARED BY SPRAY PYROLYSIS FOR PHOTOVOLTAIC APPLICATION**

MUGAMBI NELSON – M.Sc.

**Department:** Physics  
**Supervisors:** Dr. M. Munji  
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Nickel doped tin oxide and tin monoselenide thin films were coated using spray pyrolysis. Nickel doped tin oxide Precursor solution was prepared using a 0.05M Tin (II) Chloride (SnCl$_4$.2H$_2$O) and 0.05M Nickel chloride 6-hydrate (NiCl$_2$.6H$_2$O) in de-ionized water and then being added in ethanol in the ratio 1:1 to get equal proportions, followed by about 2-3 drops of hydrochloric acid. Doping tin oxide was done using uniform concentration of (NiCl$_2$.6H$_2$O) of 0-10%. Precursor solution of tin selenide S$_x$Se$_y$ was prepared using alcoholic solution consisting of tin chloride Sncl$_2$.2H$_2$O and 1,1-dimethyl-2-selenourea (C$_3$H$_8$N$_2$Se) and then heated while stirring and left for about a week. Samples of (Sn$_x$Se$_y$) were made in ratios of 1:0.4 to 1:1.4. Thin films of SnO$_2$, SnO$_2$: Ni, SnxSe$_y$ and SnxSe$_y$- SnO$_2$: Ni were deposited on glass substrate using Spray pyrolysis at deposition temperature of 375oC. The samples of tin selenide were characterized by measuring their optical properties using UV-VIS-NIR spectrophotometer 3700 DUV in the range 280nm to 1200nm and were used to calculate solid state and optical properties namely band gap (Eg), refractive index (n) and absorbance (α). The optical band gap of deposited tin selenide ranged between 1.39-2.23ev. The sample of Sn:Se1.0 had the highest
absorbance of over 46.26% and lowest transmittance of about 44.3% in the VIS-NIR region. The optical band gap of deposited Nickel doped tin oxide ranged between 3.65-3.75 ev. The sample of Nickel doped tin oxide of 2% concentration had the highest transmittance of 86.2% and lowest absorbance of about 5.05% in the VIS-NIR region. These properties are suitable for window and absorber layers for application in photovoltaic cell. The diode characteristics such as short circuit current (Isc) = 1.118mA, open circuit voltage (Voc) = 0.607V, fill factor (FF) = 0.6792 and conversion coefficient (η) = 0.4609 % was obtained for Tin selenide (SnSey) and nickel doped tin oxide (SnO2: Ni) solar cell.

EFFECTS OF DICHLOROMETHANE-METHANOLIC LEAF EXTRACTS OF Carissa edulis (Forssk.)Vahl ON HAEMATOLOGICAL AND SERUM LIPID PROFILES IN NORMAL RAT MODELS

Obel Jorum Humphrey – M.Sc

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Assessment of hematological parameters and serum lipid profiles can be used to explain blood related functions of a plant extract. The blood can act as pathological reflector and also as an indicator of the physiological state of an animal. Hematological and lipid related disorders are increasingly on the rise while conventional management of these disorders are not easily
accessible. This has prompted an increased use of medicinal plants which are readily available in the management of blood disorders. *Carissa edulis* (Forssk.)Vahl (Apocynaceae) like other terrestrial plants, has ethnopharmacological relevance and has been exploited by the local people in search for remedies for various diseases including those of the blood. Although *C. edulis* is widely used in managing blood related disorders in traditional system of medicine, no scientific research have been undertaken to evaluate its effects on the hematological and serum lipid profiles. This study therefore was designed to investigate the effects of Dichloromethane-Methanolic leaf extract of *C. edulis* on hematological parameters and serum lipid profiles. The plant leaves were collected from Siakago-Mbeere North Sub-County, Embu County, Kenya. The samples were prepared and extraction of the active compounds carried out using organic solvents; dichloromethane and methanol in the ratio of 1:1. Experimental rats were divided into four groups each consisting of five normal rats. The groups received oral doses of 50, 75 and 100 mg/kgbw of the extract while one group was used as control and did not receive any dosage. Blood samples were drawn from the rats at intervals of seven days then the hematological and serum lipid profiles were analysed using an auto-analyser. Screening for plants phytochemicals was conducted using the standard recommended procedures. The results of this study showed that DCM-MeOH leaf extract of *C. edulis* induced general increase in the levels of red blood cells, Hemoglobin and related parameter profiles across the 50, 75 and 100 mg/kgbw dose levels (p<0.05). The total and differential white blood cell counts also increased significantly at all the dose levels during the study period (p<0.05). Platetes and the related parameter levels also significantly increased at all dose levels during this study period (p<0.05). The triglycerides, total cholesterol and low density lipoprotein cholesterol levels, however, decreased significantly at all the dose levels (p>0.05), while high density lipoprotein cholesterol levels increased significantly during this study. Qualitative phytochemical screening confirmed the presence of various phytochemicals which included alkaloid, flavonoids, tannins, phenols, terpenes and traces of steroids which have the ability to protect the erythrocytes from oxidative damage as well as possess erythropoietin stimulatory, immune-stimulatory and thrombopoietic stimulatory activities. The phytochemicals also have the ability to alter lipid metabolism. It was therefore concluded that the plant extract, subject to various stipulated assays, moderation and approvals, may be useful in the management of hematological and lipid related disorders.

USE OF MAIZE COBS DERIVED PRODUCTS FOR REMOVAL OF SELECTED INORGANIC IONS, COLOUR AND TURBIDITY FROM CONTAMINATED WATER

DANIEL MUVENGEI MWANGANGI – M.Sc

Department : Chemistry.
Majority of Kenyans lack access to clean water due to increased population growth, high rate of industrialisation and poor waste management. The situation may worsen if immediate measures are not taken. Lead and cadmium are the main heavy metals in contaminated water and their harmful effects such as lung cancer, mental retardation and nerve disorder cannot be underestimated. Available methods for removing these metal ions from water such as use of activated carbon are very expensive and unaffordable to low income earners. Maize cobs have minimal use after maize harvesting can be utilised to reduce environmental pollution. The primary aim of this study was to investigate the ability of maize cobs derived products to adsorb both lead (II) and cadmium (II) ions and remove methylene blue and turbidity from contaminated water. Maize cobs charcoal was prepared by heating dry maize cobs in a furnace in limited air. Activation was done by use of 1.0 M sulphuric acid and heating the mixture in a closed vessel. Maize cob ash was generated by heating dry maize cobs in a furnace. Ability of these sorbents to adsorb lead (II) and cadmium (II) ions from the solution was investigated by carrying out batch experiment and varying parameters such as contact time, initial metal ion concentration, adsorbent dose, temperature and shaking speed. The data obtained was fitted into Langmuir and Freundlich models. Activated charcoal gave the best fit in Langmuir for lead ions with maximum adsorption capacity of 13.0 mg/g. For removal of cadmium (II) ions, all the adsorbents fitted in Freundlich with maize cob charcoal having the highest adsorption capacity of 24.3 mg/g and \( r^2 = 0.997 \). Among the three adsorbent only ash was found to have the ability of removing turbidity from water. This implies that maize cob derived products can be used to remove lead (II) and cadmium (II) ions from waste water.
A novel mGuide turn-by-turn Android mobile application for GPS outdoor voice navigation has been developed and presented, which is adapted for visually challenged people. The application was developed in response to the challenges of outdoor navigation by visually impaired persons. The application optimizes five map servers to give the best navigation information at any particular instance and loads map tiles very fast due to superior rendering procedures of the open street maps; loads the route statistics in the Apache SQLite database of the phone and gives turn by turn voice direction to the destination in real time. The destination points of the user are obtained in real time using open street maps and stored in the database. The user sets the preferred mode of transport to use and can record the route for offline use and has higher resolution of locating places. The application’s main page has minimum buttons for simplicity. Once the destination has been set and mode of transport chosen, then the software gives turn-by-turn voice navigation to the destination and keeps on refreshing the position of the user in real time in 10 seconds intervals. The application can be able to read inbox messages as they are received. The application gives an audio alert to the user in case of lost route and redirects the user using alternative route. The application was tested using nine totally blind students and one partially blind student from Kenyatta University who were successfully guided. In testing the performance of whole system, no sound alert between 0-10 meters from the middle of the road were heard. However, as the user deviated more than the 10 meters from the road, sound alerts were heard. The application’s response to the wrong turn from the predestined route to the time the voice alert was triggered was found to be averagely 5.23 seconds.
Despite having a lot of resources, Lake Victoria Basin has had an increase in population and land degradation and a reduction in agricultural production due to poor soil fertility. This has necessitated the use of inorganic fertilizers to boost food production. Inorganic fertilizers production contributes to emission of greenhouse gases. Use of inorganic fertilizer in Lake Victoria basin may have led to eutrophication of Lake Victoria leading to social, economic and ecological problems. Biofertilization such as rhizobia can reduce the need for inorganic fertilizers. The objectives of this study were to determine the morphological and genetic diversity of *Phaseolus vulgaris* variety rosecoco nodulating indigenous rhizobia isolates, to determine the symbiotic efficiency of the indigenous rhizobia isolates and to assess the effect of water hyacinth compost, DAP and commercial rhizobia inoculum on indigenous rhizobia populations. Rhizobia were isolated from nodules obtained from common bean plants planted in the water hyacinth compost testing farms (farm trapping) and whole soil trapping experiments in the greenhouse. Genetic diversity was carried out based on restriction digest of PCR amplified 16S rRNA gene. Rhizobia populations were estimated using the most probable number technique using *P. vulgaris* as the trap host. Symbiotic efficiency assessment of the isolates was carried out in comparison with commercial rhizobia strains and a nitrogen supplemented control.

One hundred and fifty eight isolates were obtained from whole-soil trapping experiments and were placed into nine groups based on their morphological characteristics. Four hundred and seventy two isolates were obtained from the field nodules and placed into fifteen groups. Based on Analysis of Molecular variance there was significantly $p < 0.05$ high genetic variation within and not among populations or regions of rhizobia isolates from Lake Victoria Basin. Principal component analyses revealed sympatric speciation of the rhizobia isolates. Cluster analysis based on genetic data and morphological data were congruent. There was negative correlation between rhizobia Shannon diversity index and soil characteristics (pH, nitrogen, available phosphates, soil organic matter). Application of water hyacinth compost prepared using effective microorganisms (EM), water hyacinth compost prepared using manure and inoculation with commercial rhizobia strain significantly ($p = 0.009$) increased indigenous rhizobia populations in the soil. Diammonium phosphate application significantly ($p = 0.009$) decreased rhizobia population in the soil. Soil characteristics, pH, nitrogen, available phosphates, and soil organic matter significantly ($p < 0.05$) influenced rhizobia populations in the soil. There was a significant ($p = 0.001$) difference in symbiotic efficiency of representative rhizobia isolates with some of the isolates having symbiotic effectiveness above 100% in comparison with the nitrogen supplemented control. Some of the isolates had symbiotic effectiveness above the commercial *Rhizobia leguminosarum* (strain 446) which had symbiotic effectiveness of 110.87%. Due to the high diversity and symbiotic efficiency
of some of the rhizobia isolates from Lake Victoria Basin in the present study this shows that the region is a suitable genepool of rhizobia inoculums which can be used to improve soil fertility and common bean production. Water hyacinth compost and rhizobia inocula enhanced rhizobia populations in the soil; hence they can be used to improve soil fertility in Lake Victoria Basin. Studies should be done to establish the symbiotic efficiency of the best isolates in the field for possible inoculum production. Other molecular markers can be used to establish the true identity of the rhizobia isolates.

INFECTIONS WITH INTESTINAL PROTOZOA AND GEOHELMINTHS AND THE RISK FACTORS AMONG SECONDARY SCHOOL STUDENTS IN MAARA SUB-COUNTY, THARAKA-NITHI COUNTY, KENYA

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Supervisors: Dr. Lucy Kamau

Dr. Ng’ethe Muhoho

Intestinal parasitic infections caused mainly by protozoa and helminths are most prevalent in tropical and subtropical regions of the world where adequate water and proper sanitation are lacking. Helminthiasis has been listed among the three most prevalent diseases in Tharaka-Nithi County. The residents are mainly small scale non-mechanized farmers hence there is frequent contact with the soil. Chronic parasitic infection among students negatively affects their health, nutrition, cognitive development, and educational achievement. Research, treatment and control efforts have been focused largely in primary schools, while neglecting secondary schools. These interventions in primary schools have been shown to improve students’ health and academic achievements. Secondary school students potentially play a major role in transmission of intestinal parasites to entire populations since they originate from different regions of the country. The findings would enable the health sector establish programs to control intestinal parasitic infections among secondary school students and entire populations, hence improve their health. This study aimed at determining the occurrence of intestinal parasites among Form one, two and three students in four randomly selected public secondary schools both day and boarding in Maara Sub-County in Tharaka-Nithi County, Kenya. Faecal specimens were collected in May 2013, from 384 students, both male and female. The specimens were processed by direct wet
mounts and concentration technique, and then examined microscopically to determine the presence and intensity of intestinal parasites. Chi square ($\chi^2$) test was used to predict association between infection rates with age, sex and school type. The difference was considered statistically significant at p-value $\leq 0.05$. Structured questionnaires were used to collect data on transmission risk factors of intestinal parasites which were compared using adjusted odds ratio (aOR). The intestinal parasitic infection rate was 36.2%, of which 19.0% and 17.2% were due to protozoa and helminths respectively. The most commonly identified intestinal parasites were *A. lumbricoides* (10.4%), *E. histolytica* (16.9%), hookworms (3.9%), *T. trichiura* (2.9%), and *G. lamblia* (2.8%). More males (39.6%) than females (33.2%) were infected though the difference was not statistically significant ($\chi^2=3.92$ p=0.56, df=2). Kyeni Day school had the highest infection rate (42.2%) while Kajiunduthi had the least (32.8%). The parasitic infection rates were significantly higher in day schools (40.6%) compared to boarding schools at 34% ($\chi^2=249$ p=0.00, df=2). Majority of the students (96.4%) had single species infections while 3.6% had multiple protozoa and helminths infections. The co-infection rate of protozoa and helminths in day and boarding schools was statistically different ($\chi^2=15.14$, p=0.004, df=4). Most of the helminths infections among students (56.1%) were of light intensity while 25.8% were of heavy intensity. The infections were associated with involvement in farming activities (OR=3.07, CI=2.19-4.32) and water sources (OR=4.02, CI=2.57-6.92). The personal hygienic factors associated with intestinal parasitic infections were failure to boil drinking water (OR=3.3, CI=0.19-5.6), failure to wash hands with soap (OR=2.96, CI=2.07-4.21), failure to wash fruits before eating (OR=5.8, CI=3.82-8.94) and failure to wear shoes (OR=2.54, CI=1.87-3.45). This study concluded that there was high level of intestinal parasitic infections among the secondary school students with associated transmission risks. It is recommended that health education on personal hygiene and environmental sanitation be adopted in secondary schools in order to reduce intestinal parasitic infections among students. The County medical services should conduct deworming programs in secondary schools once every three months together with screening and treatment of protozoa infections.

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CHARACTERIZATION OF SnxSey /SnO2: Co p-n JUNCTION DEPOSITED BY SPRAY PYROLYSIS FOR PHOTOVOLTAIC APPLICATION

**RIUNGU GEOFFREY GITONGA – M.Sc**

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Dr. R.J. Musembi
Research on utilization of solar energy has been stimulated by Energy crisis in everyday usage of energy. Photovoltaic hold great hopes towards solving energy crisis since they are environment friendly, sunlight is free, abundant and not likely to be exhausted in the near future. In this study SnxSey and SnO2: Co thin films were prepared by spray pyrolysis deposition technique at deposition temperatures of 400 K and 500 K respectively. SnxSey precursor was prepared using 0.05M SnCl4:2H2O and 0.05M 1-1 dimethyl selenourea (C3H8N2Se) in a mixture of deionized water and isopropyl alcohol in the ratio of 1:3. Different SnxSey (y/x) ratios were prepared ranging from 0.4 to 1.4. Cobalt doped SnO2 precursor solution was prepared by dissolving 0.025 M of Tin IV chloride 2 hydrate (SnCl4:2H2O) and cobalt nitrate 6-hydrate (Co (NO3)2 6H2O) in a mixture of deionized water and ethanol in the ratio of 1:1. Doping was done using Co (NO3)2:6H2O from (0-10%) wt. Optical properties of the films were characterized. Transmittance and reflectance data was measured using Shimadzu Solid Spec-3700 UV-VIS-NIR spectrophotometer in the range 280-1200 nm. Scout software was used in data analysis after which optical constants were calculated. The calculated band gap (Eg) of SnSe ranged from 1.98eV to 1.38eV. The SnSe sample of ratio 1:1 had higher absorbance in visible region of up to 47.51% and relatively lower transmittance and reflectance of 44.45% and 8.04% respectively. Transmittance for SnO2: Co thin films was >80% for all films while reflectance and absorbance were relatively low. Upon cobalt doping optical band gap of SnO2: Co thin films decreased from 3.56 eV at 0% doping to 3.22 eV at 6% doping. At 4% Co doping highest transmittance in visible region of up to an average of 86.20% was obtained. Measurement of sheet resistivity was done using four point probe connected to a Keithley source meter interfaced with a computer LabVIEW program. The sheet resistivity at room temperature (25oc) for SnSe was 28.67±0.05 Ωcm and that of SnO2: Co decreased from 48.50 cm±0.05 at 0% doping to 37.53 ±0.05 Ωcm (10%) doping. A ratio of SnxSey [y/x] 1.0 and SnO2: Co (4% doping) was used to fabricate a p-n junction solar cell. The p-n junction solar cell had an open circuit voltage (Voc) of 0.62V, short circuit current (Isc) of 1.16mA, fill factor (FF) of 0.732 and conversion efficiency (η) of 0.525%. Tin Selenide and cobalt doped SnO2 are therefore candidates for solar cell devices.

CLARIFICATION OF COLLOIDAL AND SUSPENDED MATERIAL IN WATER USING TRIETHANOLAMINE MODIFIED MAIZE TASSELS
Suspended particles in water are a major concern in global pollution management. These particles are very small and are evenly distributed in the water. They originate from factors such as decomposing organic materials and algae. They are a significant factor in the water clarity, as they limit penetration of sunlight; provide a good environment for bacterial growth, contributing to fouling and unpleasant odours that compromise aesthetic appreciation of the water. They also complex with metals in the soil making them soluble and hence available for poisoning. Thus there is need for the removal of suspended matter in water. Removal of suspended solids is normally achieved through sedimentation or filtration. However, some suspended colloidal particles are very stable in water and cannot settle while others are able to pass through the filter because of their small sizes hence difficult to remove. In this regard, alternative methods for their removal need to be explored. This study investigated the use of a soluble polycation made from modifying maize tassels with triethanolamine to form a quaternary ammonium compound. The modified quaternary ammonium compound becomes permanently charged hence is suitable for flocculation of suspended particles in water. The modified maize tassels material was characterized using Fourier-transform infrared (FTIR). It was found that the triethanolamine was chemically anchored within the cellulose structure of the maize tassels. Clarification parameters such as settling time, reagent dosage and pH were investigated. This study reports that the best clarification was obtained at a pH of 6.0. The optimal flocculent dosage for modified flocculent that could clarify 250 ml of water having a turbidity of 12 NTU (Nephelometric Turbidity Units) was found to be 3.5 ml which clarified turbid water in less than 30 minutes. Therefore, this implies that the flocculent has a potential application for the remediation of turbid waters by aggregating suspended matter to clarify water.
Sub-Saharan Africa accounts for high tuberculosis cases that result from widespread HIV infections, which is exacerbated by injection substance use. Immunologically, HIV critically impairs cell-mediated host responses to *Mycobacterium tuberculosis*. IFN-γ, IL-10 and Acrp30 are key mediators of systemic inflammation. Although circulating IFN-γ and IL-10 levels are increased, Acrp30 levels are lowered and associated with disease severity among HIV and TB co-infected non-substance users. In contrast, circulating IFN-γ and Acrp30 levels are decreased while IL-10 levels are upregulated among injecting heroin addicts. However, no studies to date have reported on these cytokine profiles among Kenyan HIV-1 and TB co-infected injection drug users. This study, therefore, investigated plasma IFN-γ, IL-10 and Acrp30 levels among IDUs, and their association with CD4+ T cell counts, HIV-1 viral load and BMI. A cross-sectional study was conducted from August, 2012-November, 2013 using 138 participants recruited at Bomu hospital; a major centre for rehabilitation of drug and substance users in Mombasa County. Following informed consent, IDUs were enrolled through respondent driven sampling, snowball and makeshift methods while convenience and purposive sampling were used for recruiting the control group. IDUs and controls were screened for HIV and TB respectively through Determine™ and Bioline™ rapid tests, and Ziehl Neelsen stained sputum smears. Subsequently, the study participants were categorised into: HIV-1/TB co-infected ART-naive (n=9) and -experienced (n=27); HIV-1 mono-infected ART-naive (n=26) and -experienced (n=13); TB mono-infected (n=21), HIV-1 negative and TB uninfected (n=25) IDUs and controls (n=17). Demographic, drug use information and physical measurements were recorded using assisted interviews. EDTA venous blood samples were collected and used for preparing plasma and enumerating CD4+ T cell counts. Frozen plasma samples were used for determining cytokine concentrations, and HIV-1 viral load. CD4+ T cell counts were enumerated using flow cytometry; cytokine levels were measured using a sandwich ELISA technique, while HIV-1 viral load was determined by RT-PCR, respectively. Across-group comparisons in continuous data were performed using Kruskal Wallis followed by post-hoc Dunn’s tests. Plasma IFN-γ (P<0.0001), IL-10 (P<0.0001) and Acrp30 (P=0.006) levels differed significantly across groups. IFN-γ levels were high in co-infected ART-naive (P<0.001) and -experienced (P<0.001), and HIV-1 mono-infected ART-experienced (P<0.001) IDUs relative to healthy controls. IL-10 levels were elevated in uninfected IDUs (P<0.001) compared to healthy controls. Acrp30 levels were lower in TB mono-infected (P<0.01) relative to controls. IFN-γ/IL-10 ratio varied across groups (P<0.0001) and higher in co-infected ART-naive (P<0.001) and -experienced (P<0.001), and HIV-1 mono-infected ART-experienced (P<0.001) compared to uninfected IDUs. The IFN-γ/Acrp30 ratio also differed across groups (P<0.0001) with HIV-1 mono-infected ART-experienced (P<0.001), and co-infected ART-naive (P<0.001) and -experienced (P<0.001) IDUs exhibiting higher ratio relative to uninfected IDUs. CD4+ T cells correlated inversely with Acrp30 (ρ=-0.717, P=0.030) levels in TB mono-infected IDUs whereas BMI correlated positively with Acrp30 (ρ=0.523, P=0.022) among co-infected ART-naive IDUs, respectively.
Altogether, circulating IFN-γ, IL-10 and Acrp30 production is altered in ART-naive and -experienced HIV-1 and TB co-infected IDUs, suggesting a role as disease markers in HIV and TB co-infection among IDUs.

**EVALUATION OF ANTI – APHIDS PROPERTIES OF THE AQUEOUS CRUDE FRUIT SAP EXTRACT OF Solanum incanum**

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**Supervisors: Dr. Mathew Piero Ngugi.**

**Dr. Allan Jalemba Mgutu.**

The green peach aphid, *Myzus persicae* is a worldwide aphid species which is responsible for important economic losses. Its feed on more than 50 plant families, causing great losses to agro industrial crops, vegetables, horticultural crops and stone fruits and it is presently categorized as one of the most important agricultural pests worldwide. Conventional insecticides used for aphids control are expensive and arguably associated with various severe adverse side effects hence the need to develop botanical pesticides that are effective as alternative. *Solanum incanum* is a perennial, wild shrub like herb that belongs to family Solanaceae, which grows in many regions of Africa, Middle East and Far East Asia. Though *S. incanum* fruits sap has been used by the local farmers to control aphids, review of the literature show no scientifically investigated report of its effectiveness and the mode of its insecticidal action. This study was therefore designed to evaluate anti-aphids properties of crude fruit sap extract of *S. incanum* and its possible inhibition of acetylcholinesterase enzyme in green peach aphids. A total of 180 kales plants were planted in the Plant Transformation Laboratory of Kenyatta University. They were divided into six groups with 10 plants each. Each group was subjected to routine spray with 10, 25, 50 and 75% *S. incanum* extract. Group five was sprayed with dimethoate and the last group
was sprayed with water. The number of live and dead aphids was counted with the help of hand lens for two weeks after every spray in each group with an interval of one day to determine the deterrent and insecticidal activity. Acetylcholinesterase inhibition was determined using Ellman method. The *S. incanum* extracts at different concentrations tested showed insecticidal and deterrent activities against green peach aphids. The extract also inhibited the acetylcholinesterase of the green peach aphids at a dose dependent manner and IC50 of 49.9 was calculated. Further, phytochemical screening results showed that the crude fruits sap extract of *S. incanum* have phytochemicals associated with insecticidal and deterrent activity. The study has established that the crude fruits sap extract of *S. incanum* are effective in managing insects” pest.

**THE EFFECT OF INVASIVE SPECIES Lantana camara ON SOIL CHEMISTRY AT OL- DONYO SABUK NATIONAL PARK, KENYA.**

MARYSTELLA NANGO’NI WEKHANYA – M.Sc

**Department: Plant Sciences**

**Supervisors:** Prof. Paul Kamau Mbugua  
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Invasive species are a major ecological and management concern in natural ecosystems and pose a threat to many of Kenya’s protected areas. Invasive plant species compete and hybridize with native species often to the disadvantage of the native species. Invasion can lead to the phasing out of native species and loss of ecosystem services such as water filtration, soil stabilization, and pest control. They may also result in reduction of wildlife forage or death of animals when they feed on poisonous invasive plant species. Invasion of native plant habitats by invasive plants can drastically change soil chemical properties such as pH, mineral composition and mineral levels. The aim of this study was to establish whether the invasive plant *Lantana camara* L. alters the soil chemical properties at Ol-Donyo Sabuk National Park. The key objective was to evaluate the soil nutrient composition in areas invaded by *Lantana camara* L. and how these differ from areas without *Lantana camara*. Five study sites were selected by purposeful sampling out of the existing 10 blocks. Soil samples were collected randomly from *L. camara* invaded areas and similarly from adjacent areas free from *L. camara*. The soil samples were collected during the wet season (November-December, 2014) and during the dry season (January-March, 2015). The soil samples were analysed for the following nutrients and parameters: pH, potassium (K), calcium (Ca) magnesium (Mg), total nitrogen (N), phosphorous (P), total organic carbon, manganese (Mn), copper (Cu), iron (Fe), zinc (Zn), sodium (Na) and texture. The data obtained was analysed using Two-way ANOVA test to determine difference in nutrients composition in *Lantana* invaded and non-invaded areas. Three-way ANOVA test was also used to determine the
interactions between wet and dry season, invaded and non-invaded areas and the study sites. A post-ANOVA test, Tukey's Honest Significant Difference was done to separate the means. The analysed results were presented in graphs and descriptive tables. Results from the study indicated *Lantana* invaded areas had an increase in pH value (invaded 6.88, non-invaded 6.30), P (invaded 20.76, non-invaded 18.81), N (invaded 0.36, non-invaded 0.18), Mn (invaded 1.03, non-invaded 0.84), Fe (invaded 24.97, non-invaded 17.72) and total organic carbon (invaded 1.73, non-invaded 1.72) compared to the patches with native plant species. During both wet and dry seasons *Lantana* invaded areas had an increase in pH value (dry-invaded 6.88, non-invaded 6.30; wet-invaded 6.48, non-invaded 6.30), P (dry-invaded 20.76, non-invaded 18.81; wet-invaded-21.11, non-invaded 18.81)) and Mn (dry-invaded 1.03, non-invaded 0.84; wet-invaded 0.94, non-invaded 0.77) compared to non-invaded areas. Most nutrient levels were found to be higher during the wet season compared to the dry season which could be attributed to high pH and accelerated *Lantana* biomass litter decomposition. High pH also makes P to be more available to plants that is why P was high in the *L. camara* invaded areas. The soil texture was almost the same in *Lantana* invaded and non-invaded areas. This study has revealed that *Lantana camara* remarkably changes the soil nutrient levels leading to changes in soil chemistry of invaded areas. This is in a bid to suit its survival to the detriment of the native plants. This study is hence vital for designing an effective eradication and preventive strategy of *Lantana* in Ol-Donyo Sabuk National Park and in other protected ecological habitats in Kenya.

PERFORMANCE OF RAPID IMMUNOCHROMATOGRAPHIC TEST AND THE EFFECT OF AGE AND PARITY ON MALARIA INFECTION AMONG EXPECTANT WOMEN IN KERICHO COUNTY

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Malaria is a major contributor of ill health and death particularly among infants and pregnant women in sub-Saharan Africa. The infected erythrocytes sequester in the placenta and may be present throughout the whole pregnancy period. Although microscopy is the gold standard method currently acceptable in diagnosis of malaria in hospital, it is unreliable because during pregnancy, malaria parasites disappear from peripheral circulation and remain undetectable through microscopic examination. This technique also requires expertise to perform and it is time consuming hence difficult to implement in remote areas where malaria is more common. The ability of rapid immunochromatographic tests to detect malaria parasites sequestered in the placenta has been reported but their accuracy and sensitivity in detection of malaria among pregnant women under different ecological settings remains unclear. This study compared the performance of the rapid immunochromatographic strip test relative to microscopy using polymerase chain reaction as a confirmatory test in malaria diagnosis among pregnant women in Kericho Highlands. The effect of age and parity on malaria prevalence and parasitaemia level was also examined. Blood samples from a total of 314 pregnant women attending the antenatal clinic were screened for malaria parasites using microscopy, rapid ICT and PCR. Structured questionnaires were also administered to obtain information on the effect of age and parity on malaria prevalence and parasitaemia level. Data were analyzed using Chi-square, logistic regression analysis, odds ratio tests and Cohen kappa index computation. Out of the 314 samples analyzed by microscopy, 44 samples (14.0%) were positive for *P. falciparum* while rapid ICT diagnosed 62 (19.7%) as positive for *P. falciparum*. The sensitivity and specificity of rapid ICT was 84.4% and 96.8% respectively while that of microscopy was 68.8% and 100.0% respectively. The Cohen kappa index (k) indicated a moderate level of agreement between results of the rapid immunochromatographic strip test relative to microscopy and high level of agreement when rapid ICT results were compared against microscopy and PCR results (κ = 0.517; p <0.001 and κ = 0.821; p <0.001) respectively. Chi-square analysis tests showed that parity had no significant effect on malaria prevalence (P < 0.001). Odds Ratio tests showed no significant difference in parasitaemia in infected multiparous and primiparous women (p=0.748) and that age had no significant effect on parasitaemia levels among the study population (p=478). Binary logistic regression analysis revealed that maternal age and parity are not significant predictors of malaria prevalence and parasitaemia level (P > 0.05). The findings of this study suggest the potential adoption of rapid ICT as a complementary epidemiology tool for malaria diagnosis among expectant women in areas of low parasitaemia and where microscopy is difficult to implement due to limited resources. The interventions on malaria control should also be geared towards control of malaria among all pregnant women irrespective of age and parity.
OPTIMIZATION OF REGENERATION AND AGROBACTERIUM-MEDIATED TRANSFORMATION PROTOCOLS FOR SELECTED KENYAN CASSAVA (Manihot esculenta Crantz) GENOTYPES

SYOMBUA EASTER DAVID – M.Sc

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Cassava (Manihot esculenta Crantz) is a tropical root crop that serves as a staple food and a vital source of income to small holder farmers in the tropics. Despite its contribution to food security, cassava production and utilization is faced by several challenges that include post-harvest physiological deterioration, insect and disease susceptibilities and accumulation of cyanogenic glycosides. Cassava crop improvement by conventional breeding has failed to address these constraints because of unsynchronized flowering, lack of resistance genes, high heterozygosity, allopolyploidy and poor seed set. Genetic transformation which begins with the establishment of embryogenic callus cultures can be used as one of the ways to complement these challenges faced by cassava breeders. This study investigated the effects of explant source (immature leaf lobes and meristematic stem segments), auxins (2, 4-dichlorophenoxyacetic acid (2, 4-D) and picloram), and photoperiod (0/24 and 16/8 light/dark) on calllogenesis and embryogenesis in five African cassava genotypes (KME 1, 08/080, 08/354, 08/274 and TMS 60444). Callus formation and embryogenesis were successfully achieved in both explant sources. The leaf explants recorded significantly higher frequencies (p < 0.05) of somatic embryogenesis compared to the stem explants in all the five genotypes. This study showed that the 0/24 light/dark photoperiod was superior to the 16/8 light/dark cycle for both calllogenesis and embryogenesis. Although statistically insignificant, 8 mg/l 2, 4-D was the best concentration for the induction of embryogenesis in 08/354, TMS 60444, 08/274 and 08/080 while 10 mg/l gave the best results for genotype KME 1. For picloram, 10 mg/l showed the best results for embryogenesis across all genotypes. This study also determined the effects of varying formulations of BAP (6-Benzylaminopurine), NAA (α-Naphthalene acetic acid) and GA3 (Gibberellic acid) on somatic embryo maturation and plant recovery of the selected cassava genotypes. Embryos in the cotyledonary stage were incubated in maturation medium supplemented with five different combinations of plant growth regulators: BAP, NAA, and GA3. Significant differences (p < 0.05) were recorded in shoot formation frequencies with combination 2 mg/l BAP, 0.01 mg/l NAA, 1.5 mg/l GA3 and combination 1 mg/l BAP, 0.02 mg/l NAA, 1.5 mg/l GA3 giving the highest rates. Transformability was determined by carrying out a histological GUS (β-glucuronidase) assay on callus transformed using Agrobacterium tumefaciens strain EHA 101 harbouring plasmid pTF 102 with a GUS visual marker gene and a bialaphos selectable marker gene. All the genotypes were found amenable to Agrobacterium mediated transformation with TMS 60444 and 08/274 recording the highest transformabilities of 73.33 % and 68.33 % respectively. A positive
polymerase chain reaction (PCR) amplification targeting the GUS gene confirmed the transfer of the transgenes into cassava cells. The validated regeneration and transformation protocols reported here can be used for the integration of desired traits in African cassava genotypes.

PERFORMANCE OF WIDAL TEST AND STOOL CULTURE AS DIAGNOSTIC METHODS FOR SALMONELLA TYPHI INFECTION IN CHUKA GENERAL HOSPITAL, THARAKA NITHI COUNTY

Gitonga Ciriaka Muthoni – M.Sc

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Typhoid fever is one of the infectious human diseases. Outbreaks of typhoid fever caused by Salmonella typhi remains a serious health problem worldwide. There are a number of tests available presently, from molecular to immunological and biochemical to microbiological. However, misdiagnosis is usually experienced since most health care facilities use only Widal test without confirmation of results with a second test method. This study aimed at evaluating the performance of Widal test and stool culture in the laboratory diagnosis of typhoid fever using blood culture as gold standard. Presenting patients aged between 5 to 82 years with symptoms clinically suspected to be of typhoid fever visiting Chuka General Hospital for a period of
eighteen months were recruited for the study. Informed consent of volunteers and guardians were obtained. Serum samples from a total of 126 patients were subjected to Widal agglutination tests. Blood and stool samples from the same individuals were analyzed for typhoid fever infection using blood and stool cultures respectively. Serotyping was performed using agglutination with *Salmonella* O, H and Vi antisera. In Widal agglutination test, titre values from 1:160 and above were regarded as significant and therefore positive for the *Salmonella* antigen. Isolation of *Salmonella typhi* from stool and blood culture indicated an infection. Raw data were entered into Microsoft excel and analyzed using statistical package for social sciences (SPSS). Analysis involved computation of descriptive statistics such as frequencies, means and standard deviations. Comparison of categorical data was made using Chi square or fisher’s exact test, as appropriate. The confidence intervals for sensitivity and specificity were computed using the Wilson’s score method. A P value ≤ 0.05 was considered statistically significant. The sensitivity, specificity, positive predictive value (PPV) and negative predictive value (NPV) for Widal test and stool culture were calculated. The total number of patients positive for typhoid fever based on Widal test were 70 (55.6%). The prevalence of typhoid fever was 42.9% and 15.1% based on the findings from stool and blood culture respectively. Widal test recorded 73.7% sensitivity, 47.7% specificity, 20% positive predictive value and 91.1% negative predictive value. Stool culture showed 84.2% sensitivity, 64.5% specificity, 29.6% positive predictive value and 95.8% negative predictive value. These results demonstrate that Widal test is not very reliable for diagnosis of typhoid fever since false positive and false negative results are common. The low PPV means that Widal test could only be useful for excluding the disease from the population hence health care personnel should not totally depend on this test alone for diagnosis of enteric fever but should use other diagnostic methods to differentiate *Salmonella* infection from other infection. There is therefore, an urgent need to develop a rapid, highly sensitive and cheap diagnostic tool for diagnosis of typhoid fever.

ANTIBACTERIAL, ANTIFUNGAL AND PHYTOCHEMICAL SCREENING OF THE PLANT SPECIES *Lannea schweinfurthii* (ENGL.) ENGL.

KIHAGI REGINA WAMUYU – M.Sc

**Department**: Chemistry

**Supervisors**: Prof. Alex K. Machocho  
Dr. Alphonse W. Wafula

Herbal medicine has been widely used and forms an integral part of primary health care in most countries. Of late, despite emphasis being put in research of synthetic drugs; interest in medicinal plants has been reborn. This is due to the rapidly growing population, the failure of modern medicine to provide effective treatment, increase in chronic diseases and the emergence of the multi-drug resistant pathogens. It is of importance to establish a scientific basis for the use and validation of medicinal plants through biological screening. Phytochemicals are currently receiving more attention due to their effectiveness in the treatment of infectious diseases as well as mitigating many of the side effects caused by conventional antimicrobials. Pharmacological
studies of *Lannea schweinfurthii* (Engl.) Engl. has revealed antimicrobial property of the plant but very little has been reported about the active ingredients in the plant. In this study the stem bark of *L. schweinfurthii* (Engl.) Engl. was collected, air-dried and ground into a fine powder. Sequential extraction was done with hexane, dichloromethane (DCM), ethyl acetate (EtOAc) and methanol (MeOH). The crude extracts were subjected to bioassay screening for their antibacterial activity against selected strains of bacteria, including Gram-positive *Staphylococcus aureus* and *Bacillus subtillis* and Gram-negative *Pseudomonas aeruginosa* and *Escherichia coli* and antifungal activities against *Candida albicans*. Moderate and high activities, ranging from 11 to 21 mm inhibition zones, were observed for EtOAc and MeOH crude extracts against the microbes used except *P. aeruginosa*. Hexane and DCM crude extracts showed mild activity of 7 mm. Tetracycline and nystatin used as positive controls for bacteria and fungi, respectively had inhibition zones of 18 mm. GC-MS analysis was done on the crude DCM and MeOH extracts to give a preliminary idea of the class of compounds in the plant species. The spectral data obtained from the crude DCM and MeOH extracts indicated presence of phenolic compounds, fatty acids and their derivatives, terpenoids, polyketide derivatives and steroids in the plant. Purification of crude extracts was carried out using solvent partition and chromatography: CC, VLC and PTLC. Structural elucidation and characterization was done using standard spectroscopic methods (1H NMR, 13C NMR, DEPT and COSY). The combined hexane/DCM extract yielded two compounds namely; 3-(10’-tridecenyl) phenol (LS01) and di-(2’-ethylhexyl) ester phthalic acid (LS05). Ethyl acetate extract gave three compounds namely; lupeol (LS02), β-sitosterol (LS03) and epicatechin (LS04). Bioassay of the isolated compounds was done in which epicatechin (LS04) showed high activity against the Gram-positive bacteria *S. aureus* and *B. subtillis* and Gram-negative *E. coli*, with an inhibition zone of 15, 14 and 10 mm, respectively. Further, epicatechin (LS04) showed an activity of 14 mm against *C. albicans*. The study has demonstrated that the stem bark of *L. schweinfurthii* has chemical constituents that are bioactive. Further studies such as cytotoxicity tests should be carried out on the crude extracts and isolated compounds to ascertain reported activity so to use bioactive components either as antimicrobials or as templates in drug synthesis. Furthermore, measures should be put in place to conserve the plant species from extinction.
GEOPHYSICAL PROSPECTION OF IRON-TITANIUM OXIDE (ILMENITE) USING MAGNETIC METHOD IN MAGAONI, KWALE COUNTY, KENYA.

ODUOR GEORGE OTIENO – M.Sc

Department: Physics

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Dr. Githiri J. Gitonga

The geology of Magaoni area is associated with the presence of heavy minerals. Magaoni neighbours Maumba and Nguluku where ilmenite was discovered by Tiomin Resource Inc. in 1996, using drilling and chemical analysis. Ilmenite mineral is known to be magnetically weak, but provides observable magnetic response. In this study, ground magnetic survey method was carried out to map magnetic anomalies of established stations, associated with ilmenite bearing formations. Energy Dispersive X-Ray Spectroscopy was also done on soil samples collected randomly from the study area to determine the percentage iron and titanium oxides, with an objective of supporting the magnetic method findings. The magnetic contour map plotted showed weak and shallow magnetic signatures spread throughout the study area. 2D Euler deconvolution solutions revealed presence of magnetised formations from near surface to a maximum depth of about 450 m at some points. The near surface weak magnetic formations indicated presence of ilmenite. The results from X-Ray Spectroscopy showed elevated values of titanium dioxide, ranging from 1.5 % to 13 % which is way above the global average of about 0.7 %. The percentage iron oxide was low, ranging from 1.5 % to 4 %, this being the reason for weak magnetisation of the study area. Both the geochemical and geophysical findings clearly indicate that ilmenite is present in Magaoni. Mining can commence once a confirmation survey has been undertaken using another geophysical technique such as gravity method.

GROWTH PERFORMANCE AND PHYTOCHEMICAL PROFILES OF *Prunus africana* SAMPLED FROM MUGUGA, KOBUJOI AND KARURI, KENYA
Prunus africana (Hook.f.) is an evergreen tree that grows in African mountains. The species’ bark and bark extracts are used for the treatment of benign prostate hyperplasia. The pharmacological efficacy of the extracts is said to be due to synergistic effect of several compounds such as phytosterols, pentacyclic triterpenoids and ferulic acid esters. High demand for the bark and bark extracts has led to over-exploitation of natural population of the species. As a result, *P. africana* is listed as an endangered species in Appendix II of CITES. Conservation of the species can be done through domestication. However, management and growth factors need to be established first to ensure success of on-farm production. Therefore, the World Agroforestry Centre established a *P. africana* stand at Muguga, Kenya to monitor the species growth and performance. The main objective of the current study was to evaluate and compare growth characteristics and phytochemical profile of trees in the domesticated stand at Muguga, with reference samples from Kobujoi, a wild stand and Karuri a remnant on-farm stand. Extraction of compounds was done using aqueous, hexane, dichloromethane and methanol solvents. Phytochemical analysis was done using Liquid Chromatography and Gas Chromatography-mass spectrometry. Gas Chromatography-Mass Spectrometry data was analyzed using GC Chemstation software version 11. Height of trees in the domesticated stand at Muguga ranged from 3 meters to 14 meters and diameter at breast height from 0.9cm to 104.5cm. Out of the 273 trees in the plantation, 92 (33%) were fruiting at the time of data collection. Evaluation of the crude yields of organic extracts of the three populations showed no significance difference (*p* >0.05). From the three stands, bark sample essential oils were essentially composed of myristic acid, linoleic acid, lauric acid, methyl myristate, methyl laurate and methyl linoleate. These compounds lower cholesterol levels in prostates of BPH patients. Campesterol, β-sitosterol, lup-20(29)-en-3-one, palmitic acid, β-sitostenone, (3,β., 5,α)-stigmast-7-en-3-ol, stigmastan-3,5-diene and α-tocopherol were detected in dichloromethane and hexane extracts of the three populations. (3,β., 5,α)- stigmast-7-en-3-ol, β-sitosterol and β-sitostenone increase urine flow and inhibit prostaglandin production in the prostate. Cyanidin-o-galactoside, cyanidin-3-o-rutinoside, procyanidin B5 and robinetinidol-(4-α-8) catechin-(6,4-α)robinetinol are believed to inhibit cell proliferation and have free radical scavenging activity on cancerous cells. Ursolic acid is believed to have anti-inflammatory, antioxidant and anti-proliferative effects on BPH. Karuri population essential oils had significantly (*p*<0.05) higher amounts of myristic and lauric acids. Muguga population showed significant variation (*p*<0.05) on the concentration of myristic acid, linoleic acid, methyl myristate and α-tocopherol compared to Karuri and Kobujoi populations. The results demonstrate that domestication does not interfere significantly (*p* >0.05) with the phytochemical composition of *P. africana* and thus on-farm planting can be carried out. The morphological and phytochemical data has important implications in drawing strategies for sustainable harvesting, management and conservation of this species through cultivation.
Naturally occurring radioactivity has existed in our environment since the creation of the earth. Uranium, thorium and potassium radionuclides are relatively abundant in rocks and soils. Poor agricultural practices such as excessive use of fertilizers also lead to accumulation of radioactive elements in the soil. Due to their radiation, these radionuclides pose exposure risks which could lead to health related problems like cancer to the people exposed. There is therefore a growing concern on the health risks associated with such exposure to natural sources of radiation in our environment. In this research the activity concentrations of the natural radionuclides namely 238U, 232Th and 40K were measured for soil samples collected from different sites of Narok County wheat plantation area using NaI(Tl) gamma ray spectrometer. The mean values obtained are 52.3±4.2 Bqkg⁻¹, 61.3±3.9 Bqkg⁻¹ and 1383.6±49.1 Bqkg⁻¹ for 238U, 232Th and 40K respectively. It is observed that these values of 238U, 232Th and 40K are above the world average values. Radiological health hazard indices were evaluated using these values in standard analytical methods. The results showed that the mean value of radium equivalent activity is 246.5±9.6 Bqkg⁻¹, while the values of absorbed dose rate (DR) and annual effective dose equivalent (HR) are 122.4±9.6 nGyh⁻¹ and 0.60±0.03 mSvy⁻¹ respectively. The values of external and internal health hazard indices are 0.66±0.03 and 0.81±0.04 respectively while the values of gamma and alpha indices are 0.94±0.03 and 0.26±0.02 respectively. All these values of hazard indices obtained are lower than their world permissible United Nations Scientific Committee on the Effect of Atomic Radiation (UNSCEAR) values for such environment. This shows that the risk due to radiation contamination in Narok county wheat plantation area is low.
Malaria is a major public health problem worldwide with increasing cases and deaths in sub-Saharan Africa. Sickle cell disease conditions relate geographically with malaria endemic areas. Fetal hemoglobin (HbF) moderates the clinical severity of sickle cell disease (SCD) and also provides protection against malaria. Consequently, it provides survival advantage but the data is limited. Designing a study linking HbF with protection against malaria infection has been a challenge due to potential confounders on the exposure outcome. This study therefore investigated the prevalence and levels of HbF and the IgG responses to *Plasmodium falciparum* antigens in 100 SCD patients aged 5-30 years living in a malaria-endemic area in Western Kenya. A cross-sectional study was conducted to determine the prevalence and levels of HbF and the IgG responses to a panel of eleven recombinant *P. falciparum* antigens in SCD patients. The levels of HbF and the IgG responses to each of the 11 antigens were determined using the alkali denaturation (Betke) method and the cytomeric bead assay in a Luminex suspension array technology respectively. The study reports a prevalence of up to 77% of the SCD patients with high fetal hemoglobin (>10%) with a mean and range of 19.09% (1.44-56.25%) respectively. Generally the levels of HbF increased with age (r = 0.17, P < 0.05) indicating that fetal hemoglobin provides survival advantage in SCD, in males there was an increase in HbF with age (r=0.31; P<0.05) while in females it was not significant (r = 0.02; P>0.05). The IgG responses to the multiple *P. falciparum* antigens were differently expressed in the SCD patients, preerythrocytic antigens showed a statistical difference when the mean IgG levels were compared using unpaired T test between the seropositive SCD patients and non-SCD individuals with the later having high IgG levels (P<0.05). In contrast LSANRC had high IgG levels in SCD patients (P<0.05). The IgG responses to blood stage antigens on the other hand were not statistically different between the SCD patients and non-SCD individuals (P>0.05). The IgG responses to MSP-1-42-FVO were high both in the seropositive SCD and non-SCD individuals. However, when compared with the non-SCD individuals using unpaired T-test, the non-SCD individuals had significantly high levels of IgG responses to both the preerythrocytic
and the blood stage antigens than the SCD patients (P<0.05). Using Spearman’s rank correlation analysis, HbF positively correlated with the IgG responses to LSA-NRC (r= 0.26; P<0.05), other antigens showed no correlation. This implies that HbF can provide protection against malaria in SCD patients living in malaria endemic areas and thus increase their life expectancy. The findings also reinforce the previous findings that antibody cooperates with fetal hemoglobin to provide protection against malaria. Nonetheless, further rigorous study design approach should be used for investigations on the role of HbF on pathogenesis and chemotherapy of malaria in SCD patients.

**ISOLATION AND IDENTIFICATION OF ANTIMICROBIALS FROM *ERYTHRINA EXCELSA* BAK**

**OMBUNA NAFTAL M – M.Sc**

**Department : Chemistry**

**Supervisors : Prof. Alex K. Machocho**

**Dr. Margaret M. Ng’ang’a**

Microbial infections constitute a serious problem especially in developing countries. Several antibiotics have been developed but their use is limited due to antimicrobial resistance and emergence of new infections. Several plants have proven to be medicinal and this has necessitated research in the field of phytochemistry aimed at generating more effective antimicrobial agents. The aim of this study was to investigate the phytochemical properties with respect to antimicrobial effects of the crude and pure components from extracts of *Erythrina excelsa* against chosen available micro-organisms. The stem bark of *E. excelsa* was air dried under a shade and ground into fine powder. It was soaked sequentially using the solvents; n-Hexane, dichloromethane, ethyl acetate and methanol for 48 hours, decanted and the extracts concentrated under reduced pressure in a rotary evaporator. The crude extracts obtained were tested against two Gram-positive bacteria species; *Staphylococcus aureus* (ATCC 35844) and *Bacillus subtilis* (ATCC 6051), one Gram-negative bacteria; *Escherichia coli* (ATCC 11775)
two fungal strains; *Aspergillus niger* and *Candida albicans*. Gentamycin and Nystatin were used as standard antibiotics. Gentamycin had an inhibition zone of 17.00±0.00 mm against the microorganisms tested. Methanol extract was highly active with inhibition zones of 15.10±0.10 mm against *S. aureus* and 14.10±0.10 mm against both *B. subtilis* and *E. coli*. Ethyl acetate had a moderate activity 13.10±0.10 mm against *S. aureus* while dichloromethane had mild activity with its lowest inhibition zone being 7.10±0.00 mm against *E. coli*. In antifungal tests, Methanol extract had highest activity of 15.10±0.10 mm against *A. niger* and 13.10±0.10 mm against *C. albicans*. Dichloromethane extract was moderately active with inhibition zones of 14.10±0.10 mm against *A. niger* and 12.10±0.00 mm against *C. albicans* while ethyl acetate had mild activity of 10.10±0.17 mm against *A. niger*. Positive control Nystatin had an inhibition zone of 16.00±0.00 mm. GC-MS was used to detect the class of compounds present in *E. excelsa* such as terpenoids, phenols, fatty acids and their derivatives. The isolation and purification of compounds was done using column chromatography and preparative thin layer chromatography yielding a total of five compounds; Glutinosalactone A (55) and glutinosalactone B (56) which exhibited mild activity against the tested organisms. Glutinosalactone A (55) had inhibition zone of 10.10±0.10 mm against *E. coli*, and 11.10±0.10 mm against both *S. aureus* and *B. subtilis* while glutinosalactone B (56) had inhibition zones of 11.10±0.10 mm against *B. subtilis* and 10.10±0.10 mm against both *S. aureus* and *E. coli*. These compounds were also active against *A. niger* and *C. albicans* with glutinosalactone A (55) having highest inhibition zones of 15.10±0.03 mm against *A. niger* and 11.00±0.00 mm against *C. albicans*. Lupinifolin (57), sitosterol (58) and 3β-stigimasterol (59) had mild activity of 9.00±0.03, 8.00±0.03 and 8.10±0.03 mm against *A. niger* respectively. The structures of isolated compounds were elucidated using physical properties such as melting point and Spectroscopic techniques such as IR, 1D and 2D-NMR. The results obtained from the crude extracts and the isolated compounds show that *E. excelsa* contain bioactive compounds. The isolated bioactive compounds can also serve as templates for synthesis of more potent drugs.

**ANTIPYRETIC AND ANTIINFLAMMATORY PROPERTIES OF METHANOLIC EXTRACTS OF *Kigelia africana* (Lam.) Benth AND *Acacia hockii* De Wild IN ANIMAL MODELS**

**KAMAU KIMANI JAMES- M.Sc**

**Department:** Biochemistry and Biotechnology

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**Prof. Joseph Ngeranwa**

Pyrexia and inflammation cause discomfort, suffering and lower productivity of the victims. Non-steroidal anti-inflammatory drugs which are highly prescribed in medication of pyrexia and
inflammation have been reported to possess adverse effects. Herbal medicines may possess bioactive compounds that are safer and efficient in the management of various diseases and disorders. *Kigelia africana* and *Acacia hockii* are traditionally used to manage pyrexia and inflammation among the Embu and Mbeere communities in Kenya but there lacks scientific data to support their use. The present study determined antipyretic and anti-inflammatory activities of the two extracts in animal models to scientifically confirm their traditional use. The plant samples were collected with the help of local herbalists in Embu County, Kenya and transported to Kenyatta University for cleaning, air drying, milling, and extraction in Biochemistry and Biotechnology laboratories. Animal models were randomly divided into six groups of 5 animals each; three experimental groups (50, 100 and 150mg/kg body weight), normal control group, negative control group and positive control group. The antipyretic effect was determined using turpentine-induced pyrexia, while the anti-inflammatory effect was determined using carrageenan-induced hind paw edema method. The antipyretic and anti-inflammatory activities of the extracts were compared to reference drugs aspirin and diclofenac respectively. The stem bark extract of *K. africana* reduced the elevated rectal temperature by between 0.06 and 3.07 percent, while the stem bark extract of *A. hockii* reduced the raised rectal temperature by between 0.62 and 3.88 percent. The aspirin reduced the rectal temperature of pyretic rats by between 0.63 and 3.1 percent. The leaf extract of *K. africana* reduced inflamed hind paw diameter of mice by between 0.21 and 4.98 percent, while the stem bark extract of *A. hockii* reduced inflamed hind paw diameter by between 0.6 and 5.38 percent. The diclofenac reduced inflamed hind paw diameter by between 1.11 and 4.9 percent. The qualitative phytochemical screening indicated the presence of flavonoid, alkaloids, steroids, saponins, terpenoids, phenolics, and cardiac glycosides. The present study demonstrated potent antipyretic and anti-inflammatory activities of methanolic extracts of *K. africana* and *A. hockii* in a dose-dependent manner, which supports their traditional use. The present study, therefore, recommends that *K. africana* and *A. hockii* can be used as a potential candidate in development of antipyretic and anti-inflammatory agents.
IN VITRO AND IN VIVO ANTI-PLASMODIAL ACTIVITIES OF SENNA OCCIDENTALIS ROOTS EXTRACTS AGAINST PLASMODIUM FALCIPARUM AND PLASMODIUM BERGHEI

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Plasmodium is a genus of parasitic protozoa, many of which cause malaria in their host. Five species namely; P. falciparum, P. malarae, P. ovale, P. vivax and P. knowlesi cause human malaria. Malaria due to P. falciparum is one of the most severe public health problems worldwide with an annual estimated 207 million clinical episodes and 627,000 deaths. The use of conventional anti-malarial drugs as treatment for malaria is greatly hindered by drug resistance exhibited by the parasite. Consequently, many people in rural areas have opted for the use of medicinal plants despite the fact that there is no sufficient scientific confirmation of their efficacy. However, studies have suggested that plants contain bioactive compounds which have anti-plasmodial activities. One of such plants is Senna occidentalis (roots) which is been used by herbalist in different parts of Kenya to treat malaria. This study was therefore carried out to determine the in vitro and in vivo anti-plasmodial activities of Senna occidentalis roots from Oloolua Forest against P. falciparum and P. berghei. Aqueous, methanol, and hexane crude extracts were prepared from the roots of S. occidentealis. The in vitro assay using P. falciparum were performed each in triplicate in 96 – wells microtiter flat bottomed plates. All the extracts were subsequently assayed for in vivo (suppressive, curative and prophylactic) activities against P. berghei using a 4-day test in BALB/c mice. A total of 185 mice of both sexes were used in the three regimens in which experimental mice were treated with extracts at dose rates of 1000
mg/kg/day to 200 mg/kg/day for suppressive and 1000 mg/kg/day to 600 mg/kg/day for curative and prophylactic tests respectively being administered orally, while control groups received Phosphate-Buffered Saline and pyrimethamine at 4 mg/kg/day. Mean % parasitaemia and inhibitions were reported as means ± SEM while survivorship values were reported as mean ± SD and compared using one-way analysis of variance (ANOVA) and student t-test. All p-values < 0.05 were considered statistically significant. The results from the in vitro assays revealed that there were no significant differences between the both strains of P. falciparum (W2 – chloroquine resistant and 3D7-chloroquine sensitive strains) amongst the three extracts (p < 0.05). The crude extracts in all regimens showed a dose-dependent reduction in the levels of parasitaemia in the experimental groups of mice relative to the non-treated mice (p < 0.0001). The three extracts displayed significantly high parasitaemia inhibition at a dose rate of 1000 mg/kg/day (p < 0.05) in suppressive, prophylactic and curative tests respectively. The most effective chemotherapeutic agent was the methanolic extract with an average mean percentage inhibition of parasitaemia of 81.84%, 76.18% and 70.18% for suppressive, prophylactic and curative tests respectively. The extracts prolonged the mean survival time in all the experimental groups relative to the non-treated group (p < 0.0001). The results indicate that S. occidentalis roots possess bioactive anti-plasmodial compound. On the basis of this study, it is recommended that further study be undertaken to determine the in vitro and in vivo cytotoxicity effects of S. occidentalis roots extracts on cells and body organs.
Prosopis juliflora (Mathenge) is an exotic, evergreen leguminous plant found in the dry Coastal, Rift Valley and Northern parts of Kenya. It is tolerant to extreme environmental conditions, declared a deleterious weed in Kenya and is among top 100 most invasive species worldwide. The species leaves and pod extracts have promising pharmacological properties and have been used in treatment of various illnesses traditionally. However, information on toxicity of these extracts in animals or human is insufficient. The study assessed the phytochemical composition of leaf extracts of P. juliflora, effects on body weights, organ weights, hematological parameters, liver function markers and histopathology on major organs of Swiss albino female rats. The leaves were collected from Kenya Forestry Research Institute (KEFRI); Kitui, dried under shade, ground into fine powder and soaked in a mixture of Dichloromethane and Methanol to obtain the extracts. A total of 25 S. albino rats were used in the study. Acute toxicity test was carried out at 2000 mg/kgbw followed by a twenty eight days sub chronic toxicity study at 100, 350 and 1000 mg/kgbw extracts dosages. The control animals were administered with normal saline daily for the same duration. Animals were monitored for physical and behavioral changes including death. They were fasted overnight on 28th day and sacrificed on anesthesia on 29th day. Blood was collected by cardiac puncture in plain vials.
and vials with anti-coagulant, while various organs were excised, weighed and refrigerated in a preservative. Hematological analysis was done using haematological analyzer while liver functions tests were done using chemical analyzer. Tissue samples from the organs were processed for histopathology. Data from control and treated animals groups were analyzed by ANOVA and Dunnett’s test. Phytochemical analysis showed presence of alkaloids, flavonoids, phenols, tannins, terpenoids and saponins but not cardiac glycosides. Acute toxicity results showed that the extracts have LD$_{50}$ above 2000 mg/kgbw. There were dose related transient symptoms of toxicity including wheezing, decreased activity, and pilo-erection. No significant toxicity effects of the extracts on erythrocytes, leucocytes and platelets parameters were noticed. An isolated important rise in mean platelet volume at 100 mg/kgbw was observed. But no significant adverse effects on liver function tests were noted at 100 and 350mg/kg body weight. The significant decrease in alanine aminotransferase and increase in aspartate aminotransferase were not correlated to toxicity. The significant decrease in alkaline phosphatase followed by a significant increase at 1000mg/kgbw implied potential liver toxicity at higher dosages of the extracts. Similarly, no significant adverse changes in plasma proteins and body weights were reported. There was significant decrease in absolute kidney weight at 100 and 350mg/kgbw and significant decrease in absolute spleen weight at 350mg/kgbw dosages. Histological examination of tissues prepared had no related pathological changes. In conclusion, the leaf extracts of _P. juliflora_ was not toxic at doses below 2000 mg/kgbw and can be used safely in phytomedicine under recommended dosages. However caution should be taken on potential effects in kidney and spleen. Further research on toxicity of individual phytochemicals may be carried out.
STUDIES ON RETENTION OF BETA-CAROTENE EXTRACTED FROM 
AMARANTHUS SPECIES PRESERVED IN VIRGIN COCONUT OIL AND 
UNADULTERATED HONEY

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Dark green leafy vegetables (DGLV) such as Amaranthus spp are known to be good sources of beta-carotene, a pro-vitamin A carotenoid and a highly potent anti-oxidant. Anti-oxidants terminate chain reactions, prevent recurrence and also prevent the formation of unstable oxygen which otherwise can initiates a chain reaction that propagates to cancerous cell. Cancer is strongly attributed to poor diet as well as lack of exercise. New cancer cases are diagnosed daily, leading to a projection of 22.2 million cases by 2030, with death tolls of up to 13.2 million. This has a huge economic burden especially to developing countries. As expected of all carotenoids, beta-carotene is highly degraded in the presence of light, heat and oxygen. Methods of its preservation are a current challenge. Preservation of powdered beta-carotene encapsulated in phospholipids, refrigerated in vacuum for a hundred days preserve 90 % of beta-carotene. Vacuum conditions require expensive instruments hence a need to explore locally available options to reduce and eradicate the menace. Moreover use of steel wool as an oxygen absorber can preserve up to 60 % beta-carotene from solar dried vegetables, however sanitation and health risk are issues of great concern. This calls for alternative methods that would ensure availability and stability of beta-carotene. In light of this, the study investigated the retention of beta-carotene extracted from Amaranthus spp bought from Githurai market (Nairobi county) and separately preserved in virgin coconut oil (VCO) extracted from coconut fruits bought from Kongowea market (Mombasa county) and unadulterated honey obtained from a farmer in Eldama Ravine (Koibatek county) as matrices for preservation. The antioxidant activity of the preservatives was determined using 2.2-diphenyl-1-picryl-hydrazyl (DPPH) assay method while, reversed phase HPLC was employed for beta-carotene analysis. Monitoring of beta-carotene was done at an interval of two weeks during the first month, followed by four weeks interval up to the sixth month. One way ANOVA was used for data analysis, with separation of mean using SNK. Coconut oil and honey gave anti-oxidant activities with % Radical Scavenging Activity (%RSA) of 65.12±0.70 and 81.51±1.39 (p<0.001) respectively. The concentration of beta-carotene preserved in coconut oil and honey was 2.80±0.01 mg/100g (9.23 %) and 5.16±0.01 mg/100g (17.19 %) (p<0.001) respectively. Although there was over 80 % beta-carotene degradation the concentration of retained beta-carotene was 0.216±0.001 and 0.302±0.003
retinol activity equivalent (RAE) value higher than the recommended daily allowance (RDA). The RDA is 400 µg \((4.0 \times 10^{4} \text{mg})\) for infant while adult require 1,300 µg \((1.3 \times 10^{3} \text{mg})\). It is envisaged that data obtained from this study will be used a stepping stone on the improvement that can be done on the preservatives, hence provide basis for development of a local and cheaper method of beta-carotene availability and preservation hence contribute to reducing cancer cases in the world by availing the much needed anti-oxidants.

**IN VITRO ANTIBACTERIAL ACTIVITIES AND SAFETY OF AQUEOUS EXTRACT OF SELECTED KENYAN MEDICINAL PLANTS AGAINST DIARRHEA CAUSING BACTERIA**

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Diarrheal diseases constitute a major public health problem, particularly in the developing world, where mortality and morbidity rates are still very high. Acute diarrhea is a common cause of death in developing countries and second most common cause of infant deaths worldwide. Diarrhea is a very common complication of infection with the HIV and often leads to wasting and malnutrition. In developing countries, up to 80% of children and 90% of adults with HIV infection develop diarrhea. Many of the antibiotics used in management of diarrhea caused by bacteria are experiencing increased resistance posing a great public health concern. This calls for the need to continue searching for new drugs to control this condition. In this study, aqueous extracts of five selected medicinal plants were investigated for antibacterial activity against diarrhea causing bacteria pathogens (Salmonella spp., Campylobacter spp., Shigella spp., Diarrheagenic E. coli, Pseudomonas aeruginosa, and Proteus spp.). The clinical isolates and standard organisms were obtained from reliable laboratories of KEMRI and KNH. Identities of the micro-organisms were confirmed by colonial morphology, gram staining and biochemical test. The plants were collected within Kenya from their ecological zones. They were selected from among medicinal plants used in the treatment of various ailments using the information obtained from ethno-medical practices and literature. Aqueous extraction and freeze drying was employed in preparation of plant extracts. Disc diffusion technique was used for preliminary determination of \emph{in vitro} antibacterial activity of the extract by evaluating the ability to inhibit the growth of the bacterial species. Three out of the five selected medicinal plants extracts tested by disk diffusion technique had inhibitory activity on most bacterial isolates with inhibition diameter ranging from 9mm to 18mm. These are \emph{Senna spectabilis} (Leaves), \emph{Maytenus putterlickioides} (Roots) and \emph{Olinia usambarensis} (leaves). The minimum inhibitory...
concentration (MIC) and minimum bactericidal concentration (MBC) of the extracts with the most prominent activity were evaluated by plate dilution method. The efficacy and potency of the extracts were assessed by comparing the MIC and MBC values of the five bacterial species to the selected medicinal plant extract with those of chloramphenicol. A regression analysis was used to analyze mean MIC and MBC for each of the selected organisms. All the extracts exhibited an MBC range of 12.5 to 75mg/ml that was greater than MIC range of 6.25 to 50mg/ml, which indicates a bacteriostatic activity. This was similar to chloramphenicol, suggesting the mode of action may be closely related. In vivo toxicity of the plant extracts was assessed using mice model. The reduced growth rate, increased the percent relative organ to body weights and increased levels of some serum parameters in mice treated with plant extracts (S. spectabilis and O. usambarensis) relative to that of control indicates some toxic effects. This study will enhance understanding of efficacy and safety of ethno-medical materials in the management of diarrhea caused by bacterial pathogens. It will also promote possible scientific development of antibacterial agents from these plants.

PHYSICO-CHEMICAL CHARACTERIZATION OF RAW CLAYS USED IN POTTERY AT ILESI IN KAKAMEGA COUNTY - KENYA

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Ilesi market in Kakamega County has been known for pottery for more than five decades in spite of the fact that the clays used have not been scientifically characterized. The potters register significant losses in their production due to swelling during molding, breakages during drying and firing. The objective of this study was to characterize the clays with a view to determining their suitability for pottery. Clay soils from Ilesi deposits in Kakamega County have been physically and chemically characterized and their suitability for pottery determined. Soil samples collected from the clay deposits under exploitation were pretreated by crushing, drying, milling and desegregation on standard sieves. The mineral composition of samples was determined by X-Ray Diffractometry (XRD) and Fourier Transform Infrared spectroscopy (FTIR). The data
showed presence of a dickite which is a kaolin (6.4-15.8%), albite (15.6-22.4%), and microcline (38.2-44.6%) which are fluxes and quartz (23.6-34.8%) which is filler. The elemental composition of the clays was determined as oxides using Energy Dispersive X-ray spectroscopy (EDX). The data showed the presence of alumina (19-22%), silica (63-67%), Fe₂O₃ (4.8-7.6%) and low percentage of CaO (0.23-1.49%). MgO and Na₂O were notably below detection limit. The suitability for pottery was determined by measuring the Atterberg limits and other physical properties. The soils showed plasticity index of (9.4-18.6%), porosity (14.16±0.09-31.18±0.83%), dry shrinkage (5.48±0.24-9.76±0.24%), fired shrinkage (5.24±0.24-13.10±0.24%), moisture content (25.03-42.35%) clay content (26-38%), green compressive strength (22.17±1.12-28.83±0.20MPa) and fired compressive strength (24.92±0.37-49.23±1.35MPa), among others. These data showed that the clays were suitable for pottery. Furthermore, five combinations (R2 to R6) were formulated by mixing the clays in various ratios considering the data of results above and using the Ilesi potters mixture, R1 as the control. Their physical properties were determined and R6 showed the best limits of physical parameters measured including losses on molding, drying and firing. The data has also shown that losses can be eliminated by proper handling and mixing of the clays.

PHENOTYPIC AND GENOTYPIC CHARACTERISATION OF DIARRHOEAGENIC Escherichia coli ISOLATED FROM CHILDREN IN MUKURU INFORMAL SETTLEMENT, NAIROBI COUNTY, KENYA

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Dr. Kimang’a Nyerere

Diarrhoeal diseases in Kenya are among the five main causes of mortality in children younger than five years. Bacterial diarrhoea has been reported to account for up to 30 % of all cases of infantile diarrhoea. Among children of age five years and below, diarrhoeagenic E. coli (DEC) such as enterotoxigenic E. coli (ETEC), enteropathogenic E. coli (EPEC), enteroaggregative E. coli (EAEC) are the most important enteric pathogens and are responsible for 30 to 40 % of all the diarrhoeal episodes in developing countries. The circulation of different pathogenic E. coli is an important problem in developing countries enhanced by many factors, for example, climatic
adversities, poor sanitation, malnutrition and AIDS related immunosuppression among others. Additionally, antibiotic susceptibility profiles vary from time to time. This makes it necessary to carry out susceptibility testing frequently to ensure that the right medication is given. The objectives of this study were to characterize at molecular level the different strains of *E. coli* isolated from diarrhoea children under the age of 5 years in Mukuru Kwa Njenga and Mukuru Kwa Reuben slums in Nairobi, Kenya. Bacteria isolated between May, 2013 and July, 2013 and archived in KEMRI-CMR were used in this study. Biochemical tests were used to confirm identity of the revived samples. The study also evaluated the resistance of the identified strains to different antibiotics (ciprofloxacin 5µg, nalidixic acid 30 µg, tetracycline 30 µg, streptomycin 10 µg, chloramphenicol 30 µg, gentamicin 10 µg, ceftazidime 30 µg, amoxicillin clavulanic acid 20/10µg, sulfamethoxazole trimethoprim 1.25/23.75µg, Ampicillin 10µg and cefepime 30µg) using Kirby Bauer technique. Multiplex PCR was used to identify DEC pathotypes through detection of various virulence genes. Data was entered using Excel (Microsoft) and checked for integrity and consistency. Statistical analysis was performed with statistical package for social sciences (SPSS) version 21.0. Categorical variables were analyzed using frequency distributions. The study found out that the isolates registered high resistance against SXT (62.18%) followed by tetracycline (47.44%), ampicillin (46.15%), AMC (18.6%), Streptomycin (14.7 %), nalidixic acid (13.5%) and ciprofloxacin (10.35%). Isolates were highly susceptible to ceftazidine (96.2 %), Cefepime (96.8 %), gentamicin (93.6%) and Chloramphenicol (92.9%). Multi drug resistance was also evident in that 43.59 % of isolates were resistant to at least three antibiotics. The results of one way ANOVA showed that there was no statistical significant difference between antibiotic susceptibility profiles of *E. coli* isolates from male and female children. However, isolates from male children showed higher resistance to cefepime, ceftazidine and streptomycinwhereas isolates from female children showed high resistance to the other eight antibiotics. The findings of the study also revealed that isolates from children in Mukuru kwa Reuben (MR) showed high rate of resistance against most of the antibiotics. However, the differences between susceptibility profiles of isolates from the two locations were not statistically significant. Antibiotic susceptibility profiles did not vary significantly among isolates from children of different ages for most antibiotics apart from SXT and tetracycline (P=0.03 and P=0.05 at P<0.05, respectively). The findings of the study showed that reserve antibiotics are the best treatment of childhood diarrhoea for children in Mukuru slums. The study also recommended that Sulphamethaxazole/Trimethoprim, ampicilin and tetracycline use should be minimized since they are not effective in diarrhoea treatment.
Recent geophysical surveys have reported presence of iron ore deposits within Meru County. It has been speculated that there could be more deposits within the region. Ground magnetic surveying was used to detect magnetic rocks within host formations in Kindani area of Maua. A fluxgate magnetometer was used to measure the vertical component of the Earth’s magnetic field in some 98 stations, covering an area of about 25 km². Diurnal and geomagnetic corrections were then done on the data. A contour map that delineates anomalies in the study area was generated using Surfer 10 software. The map shows varied anomalies spread out within the region. The anomalies mostly trend on NW-SE and SW-NE directions. Four cross sectional profiles were drawn across various anomalies and the digitized data used to draw 2-D line graphs. The data obtained was used in 2D modeling using Euler software which gives estimated depths to magnetic structures at between 0m-1500m. Mag2dc modeling gives bodies of susceptibility between -1.724 SI to 1.7624 SI. The depth to top of magnetic structures ranges from 0 m to 136 m, which indicates shallow structures. A chemical analysis of some rock samples indicates quantity of Fe₂O₃ at an average of 25%. From the study, there is confirmation of iron ore deposits in the region, which confirms presence of extended iron deposits within Meru County. There is need to survey the entire Kindani plains, using different geophysical methods to delineate more deposits for possible exploitation.
ABUNDANCE, GENETIC DIVERSITY AND SYMBIOTIC POTENTIAL OF COMMON BEAN (Phaseolus vulgaris L.) NODULE ASSOCIATED BACTERIA IN WESTERN KENYA SOILS

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Plant growth-promoting rhizobacteria (PGPR) are beneficial native soil bacteria that colonize plant roots and result in increased plant growth. Those that colonise the nodules of legumes are known as nodule associated bacteria (NAB). The aim of this study was to determine the distribution and genetic diversity of NAB that colonize Phaseolus vulgaris, their abundance, and symbiotic efficiency when coinoculated with Phaseolus vulgaris in Western Kenya soils. The soil samples were collected from cultivated lands in Kisumu near Lake Victoria, slopes of Mt. Elgon and Kakamega. In each of these regions, the soil samples were collected from four regions. 1ml of soil solution at 10 fold dilution for seven dilution steps (10^-1 to 10^-7) and three replications for each dilution was used to inoculate common bean seedling in Leonard jars. They were harvested after four weeks to determine abundance of NAB using most probable number method. Common bean nodules were also collected directly from the farmers’ farms in the above three regions. Harvested nodules and those collected from the field were cleaned and surface sterilized, crushed and exudates streaked on YEM agar growth media. Pure colonies were further cultured in YEM broth at 280C for three days and the genomic DNA isolated from the bacteria using Qiagen DNA extraction kit. 16SrRNA gene was amplified by 27F and 1492R primers and
PCR products resolved by agarose gel electrophoresis and sequenced. 16SrRNA gene analysis revealed that NAB that nodulate with common beans are genetically diverse as they formed clusters on the phylogenetic tree and their distribution depends on chemical characteristics of the soil. BLASTn showered that isolated strains belonged to the genus *Pseudomonas, Providencia, Rhizobia, Klebsiella, Sphingobacterium, Enterobacter, Delfitia, Acinetobacter* and one strain did not have sequence homology at the GenBank. Mt. Elgon region had the highest population of NAB (120000 cells per gram of the soil), followed by Kisumu (1290 cells per gram of the soil) and Kakamega region had the lowest (17 cells per gram of the soil). The effect of PGPR on the yield of common beans was significantly higher ($p < 0.001$) when co-inoculated with *Rhizobia* compared to the yield of *Rhizobia* inoculated alone or control (not inoculated) ($p < 0.05$). This study therefore provides knowledge on the type of NAB that nodulates with common beans and factors that favour their distribution necessary for production of PGPR inoculants suitable to the soils of Western Kenya.

**ANTI-ACETYLCHOLINESTERASE ACTIVITIES OF LEAF EXTRACTS OF Carphalea glaucescens AND Gnidia glauca FROM MBEERE NORTH SUBCOUNTY, KENYA ON Chilo partellus LARVAE**

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The stem borer (**Chilo partellus**), one of the major constraints in maize and sorghum production worldwide. Control of **Chilo partellus** is mainly done through synthetic insecticides which are very expensive and have negative effects to environment and non-target organisms. Farmers in Mbeere use **Carphalea glaucescens** and **Gnidia glauca** in control of **Chilo partellus** because of the high cost of conventional insecticides. However, there is lack of scientific information on their mode of action is not known. This study was designed to gather preliminary data that can be used to develop a bio-insecticide to control the **Chilo partellus**. Aquous and dichloromethane leaf extracts from **Carphalea glaucescens** and **Gnidia glauca** were assayed *in vitro* for their activities against **Chilo partellus** anti-acetylcholinesterase activity. Acetylcholinesterase is one of the most efficient enzymes of nervous system which is concentrated at the cholinergic synapses and at neuromuscular synapses where it rapidly hydrolyses the neurotransmitter acetylcholine. Acetylcholinesterase plays a critical role in terminating synaptic transmission so that the next nerve impulse can be transmitted across the synapse. Plants were collected from Siakago, Mbeere North sub-county in Embu County, Kenya. **Chilo partellus** were obtained from KALRO (Katumani) and the crude enzyme acetylycholinesterase extracted through homogenizination. Activity of the isolated crude enzyme was determined as described by Ellman *et al.* (1961). Acetylthiocholine iodide was used as a substrate in the assay. The optical density (OD) was measured at 412 nm by spectrophotometer. The experiments were done in triplicates. This study bioassay six extracts concentrations for both aqueous and DCM extracts of **C. glaucescens** and **G. glauca**. Cyclone was used as the standard drug and normal control lacked the inhibitor. This design was followed for aqueous and dichloromethane of the two plants. The aqueous leaf extracts of **C. glaucescens** percent enzyme inhibition was between 86.67% – 47.57% while DCM extracts of **C. glaucescens** percent inhibition was between 73.64% - 34.54%. Aqueous extracts of **G. glauca** percent inhibition was between 90.00% - 33.63% and DCM extracts of **G. glauca** percent inhibition was between 96.97% - 35.09%. Cyclone percent inhibition was 96.97%. Results also showed that the extracts had tannins, phenols, flavonoids, terpenoids, saponins, alkaloids, cardiac glycosides and steroids which have been associated with AChE inhibition activity. Therefore, the study has revealed that aqueous and DCM leaf extracts from **C. glaucescens** and **G. glauca** have the potential of anti-acetylcholinesterase activity. Hence the studied extracts can further be purified and developed into plant- derived biopesticides.
Solar energy which is a free and abundant form of energy has the potential to provide sufficient power to the growing number of industries and population especially in the developing world. Its maximum exploitation has however been hindered by the high cost of silicon based solar cells which currently dominate the market. It has been reported that copper based thin film solar cell technology is known to be 40% cheaper than silicon based solar cells. In order to effectively exploit solar energy, research into new materials for production of cheaper and efficient solar cell must be intensified. In this study optical and electrical characterization of Copper Oxide and Zinc Selenide thin films for solar cell application were investigated. Deposition of Cu_xO_y using an Edward Auto 306 RF/DC Magnetron DC magnetron sputtering technique is reported. ZnSe was prepared by the vacuum evaporation technique. The optical properties were studied using the UV-VIS NIR Spectrophotometer Solid State Spec 3700 DUV optical spectrum analyzer. The optical band gap of Cu_xO_y was found to be in the range 1.93-2.34 eV while that of ZnSe lies between 2.32 and 2.49 eV. The sheet resistivity of the films was measured using the four point probe technique. For Cu_xO_y the sheet resistivity lies between 36.25 and 53.92\,\Omega\,cm while that of ZnSe lies between 86.95 and 102.85\,\Omega\,cm. The electrical properties of the fabricated pn junction were investigated using a solar simulator. The open circuit voltage (V_{oc}), short circuit current (I_{sc}), Fill Factor (FF) and efficiency (\eta) of the pn junction were found to be 0.59 V, 1.06 mA, 66.6\% and 0.42\% respectively. Cu_xO_y-ZnSe exhibit photovoltaic behaviour and are suitable for solar cell applications. Further research to improve the cell efficiency is recommended.

Cancer is referred to as uncontrolled abnormal proliferation of body cells. It is a leading cause of death in developed world and second leading cause of death in developing world. Currently cancer treatment and management is a challenge due to complexity of the disease, toxicity of
chemotherapy and unaffordability of treatment. Therefore, it is imperative to investigate complementary and alternative medicine for leads and development of anticancer drugs. Cassia abbreviata has traditionally been used for its ethnotherapeutic properties and pharmacological activities. It has been reported to possess antiproliferative activity, though up to date there is no scientific evidence to validate this claim. The main objective of this study was to determine the antiproliferative activity of aqueous root bark extract of Cassia abbreviata on hepatocellular carcinoma (HCC), Vero, and Macrophage cell lines in vitro. The antiproliferative effects of aqueous root bark extract of Cassia abbreviata was determined using MTT assay. The results showed that aqueous root bark extract of Cassia abbreviata has antiproliferative activity against HCC, Vero and Macrophage cell lines. The extract had the highest antiproliferative activity against HCC cell line with an IC50 of 1.49μg/ml as compared to 81.08μg/ml and 128.38μg/ml in Macrophages and Vero cells respectively. The IC50 observed on non-cancerous normal cells (Macrophages and vero cells) indicated that aqueous root bark extract of Cassia abbreviata had little antiproliferative effects on normal body cells hence regarded as safe. The extract contained flavonoids, phenols, tannins and saponins. In conclusion the antiproliferative activity of aqueous root bark extract of Cassia abbreviata observed could be attributed to the phytochemicals present in this plant extract. The results of this study, validates the claim that aqueous root bark extract of Cassia abbreviata has antiproliferative activity and justifies its use in herbal medicine.

Ph.D

FUNCTIONAL CHARACTERIZATION OF PEROXISOMES AND PEROXISOME PROLIFERATOR ACTIVATED RECEPTOR GAMMA IN THE CHICKEN RESPIRATORY SYSTEM

MUTUA PATRICK MBUVI – Ph.D

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Supervisors: Prof. Micheal M. Gicheru

Dr. Lucilla Steinaa

Dr. Shadrack Muya
Poultry farming is important in mitigating food insecurity through provision of animal proteins. However, growth of poultry is constrained by high mortality of domestic birds occasioned by respiratory disease conditions. In the mammalian lungs, therapeutic agents improve the ability of peroxisomes to discharge antioxidant enzymes which resolve oxidant mediated inflammatory disease conditions by degrading reactive oxygen species. Despite incessant exposure of the avian respiratory system to exogenous and endogenous oxidants with subsequent risk of inflammatory injury, information regarding distribution and the antioxidant properties of peroxisomes in the chicken respiratory system remains scarce. Further, in the mammalian lungs, peroxisome proliferator activated receptor gamma (PPARγ) ligands activate respiratory macrophages to restore alveolar architecture through clearance of inflammatory sites with diminished proinflammatory cytokine production. There is no empirical data to support assertion that PPARγ ligands induce anti-inflammatory properties in the free avian respiratory macrophages (FARM). The aim of this study was to establish distribution of peroxisomes and catalase, the principal peroxisome antioxidant enzyme, in the chicken respiratory system, and to elucidate anti-inflammatory roles of PPARγ ligands in the FARM. The study was conducted in the department of Zoological Sciences, Kenyatta University and electron microscopy done at the department of Veterinary Anatomy and Physiology, Chiromo Campus, University of Nairobi. A total of 44 indigenous chickens aged 8 months were used. Diaminobenzidine and immunohistochemical staining methods were used for identification of peroxisomes and catalase respectively. FARM were recovered by lavage of the chicken respiratory system and treated with troglitazone, a selective synthetic PPARγ ligand, for one hour. To determine the phagocytic capacity of treated FARM, the cells were co-cultured with particles for three hours. Further, treated FARM were stimulated with LPS and TNFα secretion by the cells assessed using ELISA test. Peroxisomes formed fine electron dense granular matrix and were spherical in shape with an average diameter of 0.9 μm. Peroxisomes were equivalently (P > 0.05) distributed in the lung and bronchi tissues which had a mean volume density of 38 ± 1.5% and 37 ± 1.7 % respectively. However, the trachea had significantly (P < 0.05) fewer peroxisomes compared to lung and bronchi. The mean volume density of peroxisomes in the trachea was 16 ± 1.8 %. Catalase was abundant in the trachea ciliated epithelial cells and in the epithelia lining the bronchiolar junctions. In the lungs, catalase was abundant in the epithelia lining of air capillaries and the enzyme was expressed in FARM. Troglitazone treated FARM exhibited significantly (P < 0.05) higher phagocytic index than untreated FARM. The mean volume density of internalized particles per unit volume of a FARM was 41 % and 21% in the troglitazone treated and untreated FARM respectively. Additionally, troglitazone treated FARM significantly (P < 0.05) decreased LPS-induced TNFα production in a dose dependent manner. In conclusion, peroxisomes and catalase are strategically located in the avian respiratory system. Further, PPARγ ligands induce anti-inflammatory properties by enhancing phagocytic ability of the FARM and by attenuating pro-inflammatory cytokine production in activated FARM. Therefore, therapeutic agents targeting peroxisomes and PPARγ ligands could be used to supplement the current regimen of vaccines and antibiotics in treatment and management of inflammatory disease conditions of the avian respiratory system.
A NUMERICAL INVESTIGATION OF TURBULENT NATURAL CONVECTION IN A 3-D ENCLOSURE USING $k-\omega$ SST MODEL AND PISO METHOD

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Department: Applied Mathematics

Supervisors: Dr. Awuor Kennedy Otieno

Prof. Francis Kimani Gatheri

In turbulent natural convection transport mechanism, fluid motion is generated by buoyancy-induced density gradients resulting from internal body forces due to heating. The objective of this study was to conduct a numerical investigation of turbulent natural convection in a 3-D cavity using the $k-\omega$ SST model and the PISO method. The problem being investigated was computational study of turbulent natural convective flow using a primitive variable to solve time averaged momentum equation instead of using the vorticity-vector potential formulation. The statistical-averaging process of the mass, momentum and energy governing equations introduces unknown turbulent correlations into the mean flow equations namely Reynolds stress $(\overline{u_i u_j})$ and heat flux $(\overline{u_i \theta})$, which were modeled using $k-\omega$ SST model. The RANS equations, energy and $k-\omega$ SST turbulent equations were first non-dimensionalized and the resulting equations were discretized using Finite Volume Method and solved using PISO and SIMPLEC algorithms. Second order upwind was set for the momentum and energy discretization equations. The residuals convergence criterion was such as to reduce the absolute residuals below of $1.0 \times 10^{-6}$ for energy and $1.0 \times 10^{-5}$ for continuity, momentum and $k-\omega$ SST turbulent equations. The solutions are presented at Rayleigh number of $1.58 \times 10^9$, an Aspect Ratio of 0.5 and Prandtl of air of 0.71. The results were then validated using experimental benchmark results. The results showed that use of PISO method improves convergence time and speed, improves computational effort per unit time, absolute error in the solution of flow variables diminishes faster, the Pressure term is solved and as a result, profiles for wall shear stress and static pressure have been obtained and convective heat transfer is more significant than conduction in turbulent natural convection in a 3-D cavity. The velocity and thermal profiles obtained are important for thermal comfort, efficiency of energy balance and the effectiveness of the ventilation system when modeling air flow in buildings.
ANTINOCICEPTIVE, ANTI-INFLAMMATORY AND ANTIPYRETIC EFFECTS OF
*Solanum incanum* (Linnaeus), *Craterostigma pumilum* (Hochst) AND *Euclea divinorum* (Hiern) IN ANIMAL MODELS.

JOHN KINGORI MWONJORIA – Ph.D

Department: Biochemistry and Biotechnology
Supervisors: Prof. Joseph N. Ngeranwa

Dr. Charles G. Githinji

Dr. Alphonse W. Wafula

*Solanum incanum, Craterostigma pumilum* and *Euclea divinorum* have been used for generations as folklore medicine for various ailments associated with pain and inflammation in humans in Kenya. However, there is scarcity of data on scientific studies done on their effectiveness, modes of action, toxicity and their phytochemical composition. The aims of this study was to evaluate the antinociceptive, anti-inflammatory and antipyretic potential of these plants crude extracts, to determine the antinociceptive and anti-inflammatory mechanisms of action, toxicity as well as the phytochemical composition of alkaloid rich fractions of these plants. Antinociceptive and anti-inflammatory effect assays were carried out using formalin test and formalin induced paw edema in rats. Pyrexia was induced in rats using lipopolysaccharid and rectal temperature taken using a digital thermometer. Alkaloid rich fractions of *S. incanum* and *E. divinorum* were screened using formalin pain and inflammation tests in mice while antipyretic effect of *S. incanum* alkaloids was tested on rats. The antinociceptive mode of action assays involved injection of various receptor agonists and antagonists which included atropine an antagonist for M2 muscarinic receptors, and ketamine an N-methyl D-aspartate receptor blocker. Evaluation of anti-inflammatory mode of actions involved carrageenan leukocyte migration assay and histamine induced pedal edema. Phytochemical assay was carried out using standard procedures while LC-QToF MS was used in identification of the metabolites in alkaloid rich fractions. Extracts from the three plants caused significant (p < 0.05) anti-inflammatory effects while only
the *S. incanum* and *E. divinorum* extract exhibited significant (p < 0.05) antinociceptive effect. The alkaloids rich fraction of *S. incanum* exhibited significant antipyretic effect. Antinociception was significantly attenuated by atropine and ketamine in *S. incanum* and *E. divinorum* alkaloids treated animals respectively. Alkaloids from *S. incanum* showed no toxic effect unlike those from *E. divinorum*. The extracts contained several types of metabolites of varying quantities. QToF-MS results for *S. incanum* showed presence of tri- and tetra glycosides identified as solamargine and its derivatives *E. divinorum* contained an unidentified xylose containing glycosidic alkaloids. Hence *S. incanum* and *E. divinorum* contains alkaloids and perhaps other metabolites with analgesic and anti-inflammatory effects. The analgesic and anti-inflammatory of *S. incanum* alkaloids involved inhibition of M2 receptors and leukocyte migration respectively. *E. divinorum* alkaloids inhibited pain via NMDA receptors and inflammation via either or both H1 and H4 receptors. The finding lends support to traditional use of these plant parts for relief of pain and inflammation. Further investigation may lead to development of novel drugs for management of these conditions.

ASSESSMENT OF MANGROVE PHENOLOGY AND THE ROLE OF INSECT POLLINATORS IN FRUIT PRODUCTION AT NYEKE AND MICHAMVI MANGROVE FORESTS, ZANZIBAR

ALI, ABDALLA IBRAHIM – Ph.D

Department: Zoological Science

Supervisors: Dr. Eunice W Kairu

Dr. Zakia M Abubakar

Mangrove forests are evergreen estuarine and open systems which receive nutrients, fresh water and sediments from terrestrial environments. They vary both in their salinity tolerance and the degree to which salinity may be necessary to maintain their growth and competitive dominance. Mangroves grow throughout the tropics wherever the average monthly minimum temperature is at least 200C. The ecological importance of mangroves are due to the ecosystems’ ability to maintain marine life, their high productivity and role in supplying organic material to other
coastal marine ecosystems as reported by many studies. Mangroves trees have been proven to be very important in the mangroves ecosystem. Anthropogenic activities have been shown to be the primary cause of mangrove depletion worldwide. Rising mangroves forest destruction has negatively impacted on pollinator diversity and fruit set significantly. However, little is known about the magnitudes of these issues in East Africa. This research was therefore designed to assess diversity and abundance of mangrove insect pollinators and their role in fruit set in four mangrove species at Nyeke and Michamvi mangrove forests, Zanzibar. The study was conducted in two mangrove sites in South region of Zanzibar, Nyeke mangrove forest located between 60 19’ and 60 24’ S and 390 25’ E, and Michamvi mangrove forest located between 60 14’ S and 390 49’ E. The distance between the two sites is approximately 25km. Four mangrove species which are pollinated by insects \((\text{Rhizophora mucronata, Bruguiera gymnorhiza, Ceriops tagal and Avicennia marina})\) selected from Nyeke and Michamvi mangroves forests were used in the study. The reproductive phenology, reproduction relationships of mangroves, pollinator species diversity and richness, and effect of pollination on fruit set were investigated. The study found that reproductive phenology varied among species and sites. The peak fruit set varied among species and sites. There was a positive relationship between temperature and reproduction but not with rainfall and relative humidity. In both sites the findings showed a weak relationship between fruit set and number of fruits. The study also revealed that increase in number of insect flower visitors and visits did not result in increased fruit sets. However, increase in number of flowers increased the number of insect flower visitors and visits. A total of 18029 insect flower visitors representing 70 species in 7 orders and 40 families were observed visiting flowers of the four mangrove species in both sites. Family Apidae of the order Hymenoptera was the most common and insects of this order were found in all four mangroves species. \text{Apis mellifera} was the most dominant flower pollinator for \text{Bruguiera gymnorhiza, Ceriops tagal and Avicennia marina}. \text{Hypotrigona gribodoi} was predominantly found on RM and is potentially the flower pollinator of this species. Higher number of \text{Apis mellifera} 721 (32.2\%) was recorded in \text{Bruguiera gymnorhiza} at Nyeke site. Bagged experiment that prevented most pollinators accessing the flower, showed a high percentage of flower abortion and lowest fruits produced than other treatments in this study. \text{A. marina} had confirmed lower fruit set compared to the other species. Pollen Supplement (PS) (hand cross pollination) produce higher percentage of fruits set and fruits in some mangroves species in both sites. This not only shows that additional pollen
enhances fertilization but also that pollination is necessary for fruit production. The study concludes that, in depth research on various variables of mangroves including inventory of pollinators, biodiversity, social economic significance, potential threats and phenology for other species and climate alteration are important for strengthen biodiversity conservation and mitigation.

IMPLEMENTATION OF A MODIFIED PROCESI ALGORITHM TO COMPUTE COVARIANTS OF BINARY FORMS OF UP TO DEGREE FIVE AND THEIR RELATIONS
Kariuki Njau Lawrence - Ph.D

Department: Applied Mathematics

Supervisors: Prof. David Malonza
Prof. Rogora Enrico
Prof. Ireri Kamuti

In his book (Procesi, C., 2007), Claudio Procesi suggested a new algorithm for computing covariants of binary forms under the action of SL(2;C), based on an iterative computations of covariants of the simpler group U+. In Procesi book the computation was carried out only for binary forms of degree 3 and 4, but the _rst signi_cant test for the algorithm would be the computation for degree 5. In 2010 summer school in Algebra organized by ICTP in Kenya, Procesi suggested the implementation of his algorithm as a project. In this thesis we implement a modi_cation of the original Procesi algorithm on the computer algebra system CoCoA, study its general properties and test it with the complete description of generators and relations of the algebra of covariants of binary forms of degree 5. The modi_ed form of Procesi algorithm computes covariants iteratively with respect to the degree of a covariant. The implementation was tested in the computation of covariants of binary forms of degree 5, which produces 23 covariants of degree up to 18. The algorithm produces the explicit list of covariants and dheir relations. As far as we know this is the most explicit description of the complete list of relations which is made available so far.
SCHOOL OF BUSINESS

Masters

EFFECT OF FINANCIAL LITERACY ON FINANCIAL PREPAREDNESS FOR RETIREMENT AMONG PERMANENT AND PENSIONABLE EMPLOYEES IN STATE OWNED CORPORATIONS IN NAIROBI, KENYA

MOURINE A. AGUNGA – M.Sc

Department: Accounting and Finance

Supervisors: Dr. Jagongo Ambrose

Dr. Ndede F.W.S

Personal finance literature underscore the fact that only a minority of households feel confident about their saving adequacy on retirement because little is known about why people fail to plan and prepare for eventual retirement and even among households with similar socioeconomic characteristics savings and wealth vary considerably. Further, questions abound on whether planning and financial preparedness costs affect retirement saving patterns considering that many households arrive close to retirement with little or inadequate financial resources to maintain their lifestyle. To better understand these issues, exploring the tradeoff between saving and consumption needs to be a priority given that saving for retirement is an important decision individuals in active employment have to make over their working lifespan. Even though empirical studies in other parts of the world have found that financial literacy helps individuals plan for their retirement adequately, efforts to test the same among employees in Kenya remains scanty. In addition to this, relatively low levels of retirement preparedness have been reported in Kenya. While some studies have been done locally on the formal sector, there is still a lack of systematically documented information on financial preparedness for retirement amongst the public sector employees and the factors accounting for this even though the public service being the single largest employer. This study therefore sought to investigate the effects of financial literacy on financial preparedness for retirement amongst permanent and pensionable employees in state owned corporations in Kenya. Specifically the study sought to establish the relationship between knowledge of financial instruments as well as the computational capability of retirement benefits and financial preparedness for retirement amongst employees. This relationship was proposed to be moderated by both individual employee demographic characteristics and prevailing financial factors. This study used a descriptive study design. The population for this study consisted of all employees (on permanent and pensionable terms) of state corporations in Nairobi, Kenya who had worked on the same corporations for five years and above estimated to be 4,619 employees. Proportionate sampling method was used to select a representative sample of 384 respondents from the 29 state corporations. The 29 corporations were selected on the basis of those corporations that had Headquarters in Nairobi Central Business District, this is arrived at
Having also considered their long term employment in nature, compliance to statutory requirements on remittance of retirement benefits and above all duty to contribute to government agenda for national development to which preparedness for retirement is considered a major factor. Primary data was collected using self administered questionnaires and the data was analyzed using descriptive and inferential statistics of means, standard deviations and multiple regression analysis respectively to test the relationship between the independent and dependent variables and presented in tables. The study found that financial literacy positively affect financial preparedness for retirement. However, knowledge of financial instrument was found to be insignificant while computation capability for retirement was significant. Demographic characteristics and financial factors findings revealed that they moderates the relationship between financial literacy and financial preparedness for retirement and both were as well significant. The study recommended the need to formulate policies and programs on education and training and as well as a well documented information in order to foster financial preparedness for retirement.

EFFECTS OF POLITICAL RISK AND MACROECONOMIC FACTORS ON STOCK MARKET RETURNS AT NAIROBI SECURITIES EXCHANGE, KENYA
WESONGA BRONO EVANS – M.Sc

Department: Accounting and Finance

Supervisors: Mr. Gerald Kalenywa Atheru.

Dr. Ambrose Jagongo

This study provides a critical review of the effects of political risk and macroeconomic factors on stock market performance in Kenya. The study was undertaken due to the country’s increasingly volatile political environment following the 2007/2008 political violence that rocked the country as a result of the fiercely contested presidential elections in addition to the erratic movement in key macroeconomic variables in the Kenyan economy. Unlike previous studies that analysed the
impact of political risk on stock returns in isolation, this study seeks to incorporate key macroeconomic variables such as interest rates, money supply, exchange rates, crude oil prices and inflation rate for a holistic analysis. The main objective of the study was to determine the effects of political risk and macroeconomic factors on stock market returns at Nairobi Securities Exchange, in addition the effects of each independent variable on the stock market returns at Nairobi securities exchange was determined. The study will not only be of importance to the investors seeking to invest at NSE by helping them understand how political risk and key macroeconomic variables affect the market performance but will also draw attention of the policy makers to macroeconomic factors with statistically significant effect on the stock market besides acting as a basis on which future studies will be based. The research is anchored on Arbitrage pricing theory, efficient market hypothesis and the presidential election cycle theory.

Using a descriptive research design, the study examined all the companies listed at Nairobi securities exchange by employing the monthly secondary data from January 2000 to May 2013; the two leading indices, that is, NSE all share index and NSE 20 share index are used as the representatives of the returns at NSE. A multifactor regression model based on Arbitrage Pricing Theory was used to analyse the data and determine the statistical significance of the effect of each variable on market performance. Both descriptive and inferential statistics were used to analyse and present data while ordinary least square techniques are applied to test the validity of the model and the relative importance of each variables in the model using Eviews statistical package. The research findings shows that there is a high correlation between the performances of NSE all share index and NSE 20 share index; the two indices were found to be moving almost in the same direction, though reacting differently to various macroeconomic factors. The findings showed that political risk, foreign exchange rate, inflation rates and interest rates have negative effect on the performance of NSE all share index. In regards to the performance of NSE 20 share index political risk, foreign exchange rates and interest rates had negative effect. On the contrary Oil prices and money supply were found to have positive relationship with both indices. Political risk had a statistically significant effect on the NSE performance. Based on the results, the researcher recommends that investors at NSE pay attention to both political risk, international oil prices, inflation and foreign exchange rates due to the significant effect these variables have on the market performance while the government and policy makers should ensure stability in
political and macroeconomic environment as this is important for the overall performance of the stock market in Kenya.

EFFECT OF PUBLIC DEBT ON ECONOMIC GROWTH IN KENYA

WANJUKI NJIRU NGUGI – M.Sc

Department: Accounting and Finance

Supervisors: Dr. Karanja Ngugi

Dr. Jennifer Njaramba

The study investigates the effect of public debt on economic growth in Kenya, between 1980-2013. The choices of period was guided by data availability and escalation of Kenya’s public debt. The main problem is that, Kenya government has been relying heavily on public debt, aid and grants as a source of finance. This has resulted to a buildup of the level of public debt stock which has led to funds being diverted to debt servicing at the expense of economic development and domestic consumption. The specific objectives for the research were to assess the effect of external debt on economic growth in Kenya, to determine the effect of domestic debt on economic growth in Kenya to find out the moderating effect the private investment has on public debt and economic growth in Kenya. The study adopted Debt overhang hypothesis, the
Crowding out effect neo-classicalists theory and Endogenous growth theory for the study objectives. Causal research design was applied and annual financial data was collected from Kenya National Bureau of Statistics and Central Bank, while economic data was collected from World Bank for the period 1980-2013. The researcher used a data collection schedule as a tool to collect time series secondary data. For this purpose two models-public debt model and Growth model have been used in this study. Debt model has been used to identify the nature and extent relationship of total public debt with the variables- total debt service, real exchange rate, real interest rate and inflation. In the debt model effect of domestic debt and external debt on the real GDP of Kenya has been captured. Times series regression model has been used to determine the effect of public debt on economic growth in Kenya and data was analyzed using E-views 8. Various tests were carried out to test for stationarity, normality, autocorrelation, heteroscedasticity using the same software package. The data series used were stationary at integrated order level zero as given in the KPSS results. The coefficient of determination (R2) indicated that about 82% of change in GDP was accounted for by the explanatory variables while the adjusted R-square of 73% further justified this effect. Public debt servicing, domestic debt , real interest rate, inflation and a lagged PIGR affected the growth of the GDP negatively while external debt, real exchange rate, lagged GDP and private investment affected growth of the GDP positively. This study recommends that public borrowing (government) from international markets and domestic debts should be contained since it leads to high cost of borrowing and crowding out of the private sector.

Ph.D

FINANCIAL FLEXIBILITY AND CORPORATE INVESTMENT AMONG NON FINANCIAL COMPANIES LISTED ON NSE, KENYA
KOORI MAIMBA JEREMIAH – Ph.D

Department: Accounting & Finance

Supervisors: Dr. Julius Korir

Dr. Paul Gachanja

The existing evidence indicates that listed companies on the Nairobi Securities Exchange Kenya are financially flexible. However, these firms have not managed to undertake corporate investments of the magnitude achieved by other countries where firms are financially flexible. Previous studies have shown that financial slack, spare debt capacity and dividend decisions
directed at maintaining financial flexibility in corporate entities can enhance investment ability of the firms. This disparity therefore motivated this study which sought to link the measures of financial flexibility and corporate investment in the Kenyan context between 2002 and 2013. This study therefore sought to establish the effects of debt capacity, cash holdings, and dividend decisions on corporate investments. The study further sought to establish the moderating effects of ownership concentration on the relationship between financial flexibility and corporate investment. The pecking order theory underpins this thesis since the management of companies have to make investment decisions based on the financial resources available both from internal and external sources with a view of maximizing the wealth of the shareholders. The respective variable indicators were used to determine the effects. Explanatory and non experimental research design was used to fulfill the research objectives. All 28 non financial companies listed on the NSE and fulfilled the set conditions in the period under the study were considered. Secondary panel data collected was sourced from annual financial reports of quoted companies and records maintained at Nairobi Securities Exchange. The study applied panel data model (fixed effects) based on the outcome of Hausman specification tests to determine the effects of financial flexibility on investment decisions of non financial listed companies on NSE, Kenya. Feasible generalized Least Square regression results revealed that leverage and asset tangibility being indicators of debt capacity had a positive association with investment decisions. Free cash flow, an indicator of cash holdings, had positive relationship with investment decisions whereas; profitability an indicator of dividend decisions had positive relationship with investment decisions. The study also found out that the moderating effects of ownership concentration on the relationship between financial flexibility and investment decisions had no effect. The study recommends that managers of listed non-financial companies should maintain accumulating reserves of borrowing power that allows them to have a better access to the capital market when faced with positive shocks to their investment opportunity. The study also recommends that managers of non financial listed companies should increase free cash flow as it has been established that investment ability of these companies rely heavily on it. Having established that free cash flow increases the ability to invest, there is need to carry out further study in order to establish whether the investments undertaken are value adding or whether they are just an expression of empire building.
Infusion of intrapreneurial spirit has been recognized and embraced as an effective way of improving efficiency, accomplishing organizational goals and giving a better competitive posture in both profit and non profit making organisations. However, empirical evidence shows that many university libraries in Kenya have remained less intrapreneurial and the level of adoption of intrapreneurial activities remains unclear. The purpose of this study was to investigate the status of these activities and their determinants in selected university libraries in Kenya. The objectives of the study were to examine the individual staff factors, determine the internal organization factors and establish the external environmental conditions that determine intrapreneurial activities in university libraries in Kenya. The study used the explanatory and descriptive research design to examine the relationship between the variables. The study targeted two public and two private university libraries with a total of 162 library staff. A sample of 114 library staff was selected using proportionate stratified random sampling. A structured questionnaire and two interview guides were used to collect primary data from library staff, university librarians and university management staff respectively. Quantitative data was analysed using descriptive and inferential statistics, while thematic analysis was applied to analyse qualitative data. The study findings showed that although individual staff factors, internal organization factors and external environmental conditions had a positive correlation with intrapreneurial activities, individual staff factors had a stronger correlation with 63.9 percent compared to the other two variables. The regression analysis indicated that individual staff factors was a stronger predictor of intrapreneurial activities, followed by external environmental conditions, while internal organizational factors had no contribution. The study arrived at the conclusion that institutionalizing intrapreneurial activities, was a response strategy of adding value to library operations, empowering individual employees and leading the libraries to become more competitive. Individual staff factors had a strong contribution to intrapreneurial activities and hence the need for more supportive policies from university management. Internal organization factors were weak and did not contribute much to intrapreneurial activities, implying that university management should take the necessary measures to ensure that these factors do not negate the intrapreneurial spirit in the libraries. Although external environmental conditions contributed to intrapreneurial activities, university libraries should be more proactive and maintain a competitive posture inorder to remain relevant. Therefore, universities should focus more on younger members of library staff so that they model into intrapreneurial activities in their workplace. A review of the training programmes for library staff by the relevant
Low reading achievement among pupils has been reported to be a wide spread problem globally, regionally and locally. Involvement of parents in their children’s reading at home has been found to reverse the predicament. Parental involvement in children’s reading is a collaborative effort which needs to be undertaken by both the parents and the child’s teacher since it has significant positive influences that include reading achievement, language comprehension and expressive language skills. Most of the studies done in the area of reading have focussed on the level of literacy performance, attainment of numeracy and literacy skills, level of competency as well as comprehension. Adequate efforts have not been made to establish the relationship that parent-teacher communication has on pre-primary school children’s reading. Communication as a form of parental involvement in Kenya has not adequately been investigated. Furthermore, the level to which parents get involved in children’s reading needed to be investigated. The purpose of this study was to establish the level of parental involvement through communication, communication strategies between parents and teachers and also to find out the relationship between these strategies and parental involvement. The theoretical framework used was derived from Joyce Epstein’s model of parental involvement. The study involved only children aged eight years and below in pre-primary schools in Mumias East Sub-county, Kenya. It employed use of survey and correlational designs. The target population consisted parents and teachers of pre-primary school children in Mumias East Sub-county, using a sample size of 180 parents of pre-primary school
children and 30 teachers from both public and private schools. Questionnaires were used to collect data. Statistical Package for Social Sciences (SPSS) was utilized to prepare and organize data for analysis to test the significance levels between variables at 0.05. Chi-Square tests were used to establish whether there were any positive significant relationships between variables. Findings revealed that the correlation between the strategies used by teachers to communicate and level of parental involvement was insignificant (p=0.392) indicating that there was no relationship between the strategies that teachers used to communicate to parents and parental involvement. Some of the major strategies that teachers were using to communicate to parents included use of report cards, talking directly to parents, participating in school activities and use of diaries. The study recommends the need for an enhanced school activities in order to strengthen parents’ participation in their children’s reading. Further studies need to be taken to identify other aspects apart from communication that do affect children’s reading.

THE ROLE OF GEOGRAPHY AS A SUBJECT IN PREPARING LEARNERS FOR CAREER PATHS: A STUDY OF SECONDARY SCHOOLS IN UASIN GISHU COUNTY, KENYA

KIPSAAT, ELIAS KIPKOGEI M.Ed

Department: Educational Communication and Technology

Supervisors: Prof. Henry Okello Ayot
             Prof. Samson Rosana Ondigi

Subject choice marks the beginning of a learner’s career path because most learners choose the subject based on their passion and interest. This study sought to identify career aspirations of secondary school students who opt to study geography; to identify reasons why students choose geography as a subject over other optional subjects in the same category and to establish geography subject’s relevance in understanding societal problems. The study was guided by Donald Super’s Vocational Development Theory because it focuses on an individual’s career development stages. The literature was reviewed according to: 1.History of the development of geography as a discipline; 2.Teaching and learning for skill acquisition; 3.Career aspirations and expectations of students and Geography’s role in the Curriculum. Descriptive survey design was employed because the respondents are given an opportunity to express their views and it determines and reports things the way they are. A sample of 260 form three geography students was obtained through simple random sampling technique from a target population of 868 students from 21 county schools in Uasin Gishu County. Data collection tools were: student’s questionnaire and student’s interview guide schedule. Data was analyzed by transcription and assigning codes according to the objectives of the study. The codes for each objective were
recorded in a codebook. All the coded questionnaires were entered into the SPSS program and run descriptive statistics. Data was presented in form of pie charts and bar graphs. The findings indicated that 31% of geography students aspire for careers related to cartography and GIS, and 9% of students aspired for careers related to geographic education. The findings also indicate that 93.8% agreed that they chose geography because they love and understand it while 57% of the respondents felt that the teacher has influence on the learner’s choice of a subject. 74.6% of the respondents felt that Geography subject is relevant in understanding environmental degradation while (45.8%) felt that the subject is least relevant in understanding drug abuse and violence. Recommendations made are that learners should be encouraged to choose geography subject as it can lead to various careers. Geography should be made compulsory among all the secondary school students because its importance in attaining a clean environment and sustainable development cannot be underestimated.

**INFLUENCE OF FREE PRIMARY EDUCATION ON TEACHING AND LEARNING OF THE ENGLISH LANGUAGE IN PUBLIC PRIMARY SCHOOLS, ELDORET MUNICIPALITY, KENYA**

**OGUTU OTENGA MANASSEH – M.Ed**

**Department: Educational Communication Technology**

**Supervisors: Dr. Bwire Adelheid**

**Dr. Babusa Hamisi**

The implementation of FPE in the year 2003 introduced many challenges to teaching and learning in public primary schools in Kenya. This study sought to find out the effects of the inception of FPE in Kenya in 2003 on the teaching and learning of English in public primary schools in Eldoret municipality. The specific objectives were to: determine the influence of FPE on teaching and learning resources; establish the influence of teaching techniques on the English language teaching and learning; to determine the influence of selected aspects of FPE on English
language teaching and learning, and; to find out the challenges faced by teachers as a result of FPE. The research design for the study was descriptive survey. The research was carried out in Eldoret municipality primary schools, Kenya, among 4200 standard six pupils and 82 English language teachers. By use of simple random sampling, 8 teachers from the 42 public primary schools, representing 10 percent of the English language teachers and 45 standard six pupils representing 1 percent of the population were involved in the study. The research instruments were: interview schedule for English language teachers and an English language proficiency checklist used to evaluate pupil’s performance on an English composition topic for pupils of standard six. Measures of central tendency such as mean, together with measures of variability, frequency distribution and t-tests were used to analyze data. It was established that FPE significantly influenced the practice of classroom discussions and presentations and adoption of learner-centered approaches, which negatively influenced pupils’ English language proficiency. Learning facilities were inadequate to undertake proper teaching and learning. Support from parents should be harnessed in a structured way. Educational and learning infrastructure should cater for the influx of pupils in these schools due to FPE. Innovative approaches need to be developed to enhance teaching and learning the Future research should explore how the community could be involved to enhance the English language teaching and learning.

DETERMINANTS OF PARTICIPATION IN SPORTS AMONG STUDENTS WITH HEARING IMPAIRMENT IN SECONDARY SCHOOLS FOR THE DEAF IN KENYA
MOSETI MORAA ZIPPORAH – M.Sc

Department: Physical Health Education

Supervisors: Dr. Peter Bukhala
Effective engagement of sports among students with hearing impairment has physiological, psychological, intellectual and societal benefits (Riungu, 2002; Smith, 2004). Although there has been great emphasis on sports and health related activities among students, there is a general concern that students with disabilities do not frequently participate in such activities. This study proceeded from the assumption that students with hearing impairment have no visible disability and therefore should participate in sports like their hearing counterparts. The study, therefore, sought to evaluate determinants of participation in sports among students with hearing impairment in Kenyan secondary schools for the deaf. The specific objectives of this study were to: establish the effect of gender on sport participation among students with hearing impairment; identify the type of sports in which most of the students with hearing impairment participate; establish the most commonly available sports facilities in secondary schools for the deaf, and establish the extent of participation in sports among students with hearing impairment in term one and two. Anchored on a descriptive research design, the study targeted 574 students with hearing impairment and 88 teachers in 7 public secondary schools for the deaf. Purposive sampling was used to select all Form 2 and 3 students as well as 3 teachers from the 7 schools translating to a total of 21 teachers and 327 student respondents. Two questionnaires; one for students and another for teachers were used in data collection. Data collected from the field was processed and analyzed using the Statistical Package for Social Sciences (SPSS) version 20. Qualitative data generated from open-ended questions using grouped into themes and analyzed according to the research objectives. Frequency tables and bar graphs were used in data presentation. Cross-tabulations and Chi-square ($\chi^2$) tests were used to test the association, if any, of variables such as gender, sports preference and sports participation. The study established that gender was a significant variable to sports preference and participation among students with hearing impairment. The findings revealed that more male students participate in sports than female students. Majority of these students were motivated to participate in sports for fun. Football was the most preferred sport type by male students while female respondents had a strong preference to volleyball and netball. Most commonly available sports facilities were football and volleyball pitches. Majority of the students with hearing impairment actively engaged in sports in term one compared to term two due to the scheduling of national competitions for SNE in term one. The study concludes that gender, sports preference, availability of sports facilities, competitions and, internal and external drives were significant determinants in sports participation among students with hearing impairment. The study recommends that simple and easy-to-use sports facilities should be provided as an enabler for more students with hearing impairment to participate in sports, and a safe and supportive environment be established to facilitate active sports engagement among female students. Special schools should provide adequate facilities for a variety of sports in line with different kinds of sports. Insights from these findings will be helpful to stakeholders in making informed decisions, and in availing sports facilities for students with hearing impairment not only in secondary schools but also in other institutions of learning such as primary schools and tertiary institutions.
PEDAGOGICAL CHALLENGES FACING THE TEACHING OF BUSINESS STUDIES AND IMPACT ON STUDENTS’ ACHIEVEMENT IN SECONDARY SCHOOLS IN NYANDARUA COUNTY - KENYA

ROBERT M KIMOTHO – M.Ed

Department: Educational Communication and Technology

Supervisors: Dr. Wilson Kerich
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The teaching of Business Studies, overtime has been recording below average performance in the national examinations all over the world, Kenya inclusive. Studies carried out in some other part of the world clearly document the reasons for this and the measures that have been undertaken to alleviate this problem. This study sought to investigate the pedagogical challenges facing the teaching of Business Studies subject and their impact on students’ achievements in national examination in Nyandarua County. The study was guided by constructivist theory which describes how learning takes place in the classroom. The study used exploratory study design to identify the challenges faced by the Business study teacher, how the teaching and learning environment determines the teaching and learning methods applied in the classroom by the teachers, to determine how well the teachers were aware of the different teaching and learning methods available and the determine whether the levels of cognitive domain tested by the Business Studies teachers in the internal examinations are in line with those tested by the examining body-KNEC. The sample size was obtained using random and purposive sampling. Data was collected from 10 teachers out of 33 Business Studies teachers. The data was gathered using teachers’ questionnaires, HoDs questionnaires, classroom Observation checklist and teaching documents. Quantitative data was analyzed using the SPSS computer programme. Qualitative data was subjected to the Spearman -Brown prediction where even and odd number questions were correlated to determine reliability. Qualitative data was analyzed through narration and constant comparison. The data was represented using frequency table tables, bar graphs and pie charts. The finding indicated that the Business Studies is taught mostly by unqualified teachers. Data analysis revealed that most of teachers were using commercially sourced schemes of work and did not have lesson plans. Mostly
teachers used expository methods of teaching and learners were passive. Since most of the teachers were not trained, they set internal examinations that only tested the low levels of cognitive domain that is knowledge and comprehension while the national examinations tested all the levels of cognitive domain. Teachers did not prepare a marking scheme nor tables of test specifications because either they were ignorant or did not know how to prepare. Due to lack of adequate teaching and learning resources, there was little integration between what was taught in class and the application of that knowledge in real life situation. The finding would help in making decision on recruitment of qualified teachers, providing appropriate resources, retraining of teachers and the school management emphasizing on the need for the teachers to prepare their own scheme of work. Appropriate recommendations were made including retraining of the teachers.

A PHILOSOPHICAL EXAMINATION OF THE NATURE OF INDIGENOUS KNOWLEDGE AND IMPLICATIONS FOR EDUCATION WITH REFERENCE TO MAASAI COMMUNITY OF KENYA

DANIEL WABWIRE – M.ED

Department: Educational Foundations

Supervisors: Prof. Paul K. Wainaina
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One of the aims of education in Kenya is to promote respect for and development of Kenya’s varied cultures. Underlying these cultures is indigenous knowledge that has not sufficiently been integrated within the Kenyan education system which remains skewed towards western values and knowledge. In such circumstances, this study argues that formal education seems to alienate people from their own culture instead of facilitating preservation and development of relevant aspects of indigenous cultures as also observed with indigenous people of North America. This is the problem that this study sought to address. Specifically, an examination of the indigenous knowledge with reference to the Maasai community was found to provide useful lessons on how best traditional values can be blended with modern values in order to achieve an inclusive and effective approach to contemporary needs and challenges. The study therefore used cultural synergism as embodied in Hegel’s dialectics as its preferred theoretical framework. This framework admits that all cultures have their unique identities but none is perfect in isolation. Consequently, cultures need to enrich and refine each other. This is especially relevant to the contemporary globalised context where interaction of peoples and cultures is inevitable. The study sought to examine the western conception of knowledge, analyse the indigenous knowledge with reference to the Maasai community, and identify a strategic approach for achieving harmony of indigenous and western knowledge systems. The researcher reviewed literature on the basis of the themes derived from the objectives above. As a philosophical study, the researcher used conceptual rather than empirical methodology. This study therefore relied on secondary data. It employed the analytic and prescriptive methods of philosophy to examine and evaluate various works of the social scientists on indigenous knowledge deriving relevant implications for education. The study found that: knowledge is constructed as a worldview that is continually re-evaluated, improved and systematised; the indigenous knowledge of the Maasai was pragmatically developed enabling the community to adapt and survive in its environment; positive elements of the indigenous knowledge of the Maasai include sustainable use of the environment, emphasis on functional and relevant knowledge and skills; values such as commitment to service, responsibility and self-discipline. Such values can be useful to education in Kenya today. The study recommends further research on indigenous communities including re-evaluation of previous anthropological research findings that were found to be clearly biased.

AN ANALYSIS OF THE FACTORS INFLUENCING ACHIEVEMENT IN MATHEMATICS GEOMETRY AMONG SECONDARY SCHOOL STUDENTS IN MAKADARA SUB-COUNTY, NAIROBI COUNTY

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This study investigated the factors influencing achievement in mathematics geometry among secondary schools student in Makadara sub-county, Nairobi county. The aim of the study was to find out the factors contributing to poor performance in Mathematics and provide a way of improving the students performance specifically in geometry. The study was guided by the following objectives: effects of teaching strategies on the students level of achievement in geometry in secondary schools, to examine the effect of student study habits on the level of achievement in geometry, to assess the effect of curriculum implementation on the students level of achievement in geometry, to examine the effects of evaluation on the students level of achievement in geometry and to determine some of the problems students encounter in learning of geometry. Two hundred and forty students selected randomly from six schools in the district participated in the study. Student level of geometrical achievement was tested using mathematics geometric achievement test (M.G.A.T), and different teaching and learning strategies explored. The key issues postulated in the study revolved around teaching strategies, student study habit, curriculum implementation, assessment and evaluation criteria on the level of achievement geometry. Data were collected using a questionnaires and the M.G.A.T. Descriptive and inferential statistics were used to establish the relationship between the aforementioned factors and the understanding of geometry among the students. The findings of this study showed that teaching strategies, students study habits, curriculum implementation and evaluation had positive and significant relationship with the level of achievement in geometry. The finding showed that 79% of the students and teachers in this study indicated poor attitude toward geometry among students was the major problem among students while 65.9% indicated lack of adequate learning resources, 62.7% indicated lack of practical sessions, 55.5% of the respondents indicated poor learning strategies used by teachers. Only 38.6% of the respondents indicated lack of enough trained and experienced teacher. The study concluded that strategies used by teachers in learning/teaching geometry contribute to the level of performance in geometry test. Teachers used strategies that don’t motivate students to excel in geometry. This study further concluded that the performance of students within the study region in geometry tests was still very poor. This can be attributed to poor attitude among students, lack of adequate learning resources and poor learning strategies used by teachers, lack of practical sessions. Lack of enough trained and experienced teacher was the least problem that affected the learning/teaching of geometry.
The main purpose of the study was to analyze the determinants of effectiveness of peer tutoring on academic performance of standard four pupils with learning disabilities in Nyeri Central Sub-County, Kenya. Literature was reviewed according to the objectives of the study. The study was premised on Vygotsky’s social development theory as the theoretical underpinning. The study adopted descriptive survey research design utilizing both qualitative and quantitative approaches. The target population was all teachers teaching class four pupils in Nyeri central sub-county, Nyeri County, Kenya. The study used questionnaires, interview guide and observation checklist as the data gathering instruments. The data collected was edited, coded, classified on the basis of similarity, and then presented in form of charts, graphs, and tables for clarity. Pearson Correlation analysis was also used as the inferential statistical methods. Since the study was a descriptive study, descriptive statistics in SPSS such as percentages, frequencies tables, graphs, and trend analysis were used to summarize and relate variables. The study found that the methods used to identify learners with LD were observation of pupils’ behavioral characteristics. It was also established that the teachers were adequately trained and well prepared to incorporate peer tutoring in their classes. The activities that peers engaged in were peer tutor demonstrating to tutee as an activity while learning socializing well, asking each other questions, concentration on task and asking guidance from the teacher. It was also found that some types of peer tutoring affected academic performance more positively than others. The study concluded that more training on methods of identifying learners with LD was important as it was critical in putting measures for early interventions. The study recommended that teachers should use professional methods of identifying learners with LD. It also recommended that government should be at the forefront of promoting policy frameworks that enhance special education in schools. Lastly, the study recommended that further studies should be conducted on the class eight pupils to establish how the candidate class copes with learners with LD.
For six years in a row, the performance of English language in general has been deteriorating, in Kenya, always attaining less than 50% in KCPE. Likewise, the performance of composition writing specifically was of great concern too. Most learners find it difficult to express themselves through selection and use of relevant vocabulary of while writing compositions. Since the knowledge of vocabulary is the single most important component of any language course, this study was to investigate and document the strategies of teaching vocabulary. It also examined the extent to which learners use vocabulary in their composition writing. Finally, it was set to find out how teachers pointed out the learners vocabulary mistakes and the learners response to the same. The study employed a descriptive research method and design. The target population was twenty two public primary schools, 2000 class seven pupils and 50 English language teachers in Thika sub-county. Stratified and purposive sampling techniques were used. The sample size was 10% of the target population of 2000 standard seven pupils and fifty teachers in public primary schools in Thika sub-county. The research instruments were the teachers’ questionnaires, a checklist, an interview schedule and written compositions test for the learners. The data were analyzed using descriptive statistics such as percentages, mean and frequency. Qualitative data was organized according to the objectives. The study addressed the gaps affecting the teaching and learning of vocabulary to help learners write interesting compositions to improve language performance in general. The study found that the decision to teach vocabulary lies squarely on teachers. This was so because 60% of teachers reported that they have time to teach vocabulary while 40% do not. Another finding was lack of consistence on how learners practice the use of vocabulary in composition writing. The study recommended that the teaching of vocabulary be prioritized. Learners who were exposed to vocabulary in various contexts were able to express themselves through appropriate use of relevant vocabulary to acquire good grades in KCPE. In conclusion, vocabulary knowledge is still an important component of English language learning as it helped learners to communicate in speech and writing. These recommendations will guide curriculum developers, designers, implementers as well as future research studies.
FACTORS INFLUENCING INTEGRATION OF DIGITAL RESOURCES IN SCIENCE TEACHING AND LEARNING IN SECONDARY SCHOOLS OF MURANG’A COUNTY-KENYA

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Department: Educational Communication and Technology

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There has been a move towards using digital resources in classroom teaching and learning over a decade now in most developed countries. This study sought to establish and analyze factors that influence integration of digital resources in science teaching and learning in Secondary Schools of Murang’a County-Kenya. The objectives of this study were to identify the interrelationship between the various aspects of the teacher’s experience and the use of digital learning resources and to identify the factors that influence science teachers’ decisions on whether or not to integrate digital resources in teaching-learning situations. This study adopted a survey research design. Murang’a County provided an ideal area of study as it has various categories of secondary schools distributed across the county. It has 267 secondary schools; by use of stratified sampling, 30 schools which represent 11.24% of all the public secondary schools were selected for the study. The study involved 90 science teachers selected by stratified sampling from various subgroups in the population. Three methods of data collection were used namely; questionnaires, interview guides and observation schedules. The questionnaires were filled by the teachers to find out those factors that influenced the integration of digital resources in the teaching and learning of science in schools. The Interviews were used so as to dig deep into the opinions held by the science teachers on integrating digital resources in the teaching and learning and the observation schedules used to ascertain information given by the respondents. A pilot
study was conducted in five schools selected representing the various categories of school as sampled for the purpose of testing the reliability and validity of the research instruments. Reliability was tested using the Cronbach’s alpha coefficient. The data collected was analysed using both qualitative and quantitative procedures. Descriptive statistics was used to analyse the data and responses from the questionnaires were tabulated, edited and coded to facilitate categorization. This was carried out using SPSS data analysis programme. Qualitative data was analysed and presented in form of discussions, explanations and in a narrative form. The study established that there is minimal use of digital resources in the teaching and learning in the classroom. Factors found to influence the integration of digital resources in classroom teaching and learning included teachers’ attitude, management attitudes, lack of ICT infrastructure, poor or lack of computer training and technical issues such as; support and maintenance of digital resources and availability and access of digital resources. Based on the findings of the study, it was concluded that there is need for continuing discussion, planning and evaluation of all ICT investment in education to gain a better insight into how digital resources can be integrated successfully into the teaching and learning environment. The study recommends that teachers be encouraged to integrate digital resources in the teaching and learning process as well as train teacher trainees to apply digital resources in their programs when in school in order to be able to use the technology to supplement their teaching activities. Also the study recommends for continuous evaluation of the use of digital resources within schools through observing, recording and analyzing on regular basis to facilitate development of integration of these resources. The findings from this research provide secondary schools with a framework of reference on successful integration of digital resources in science teaching and learning.
INFLUENCE OF 5-8 YEAR OLD CHILDREN’S AGGRESSIVE BEHAVIOURS ON THEIR EDUCATIONAL PROGRESS IN MWINGI CENTRAL DISTRICT, KITUI COUNTY KENYA

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The study was to investigate educational influence of 5-8 year olds children’s aggression. Aggressive behaviours include the behaviours that are directed in harming others and tend to be a nuisance to many people. The study was guided the Social Cognitive Learning Theory by Albert Bandura-learning by observation and modellingand Social Constructivism Learning by Lev Vygotsky-learning through interaction. The objectives of the study were to: determine the factors that contribute to aggression among children in Mwingi Central Sub County; determine the effect of children’s aggression on their educational progress; assess the effort of teachers and other children institutions in helping children with aggressive behaviours and find out the teacher’s challenges in handling children with aggressive behaviours. It was a descriptive survey in Mwingi Central Sub County in Kitui County. Through stratified sampling, the researcher picked 10 schools (5 private and 5 public) out of 104 total schools. In each school purposive sampling was used to pick aggressive children from nursery to class three. Thereafter with the help of the class teachers, two most aggressive children identified for observation. All the teachers in preschool and lower primary (4 teachers per school = 40 in total) were issued with questionnaires while 40 parents of the aggressive children were randomly selected for interviews. The District Centre for Early Childhood Education (DICECE) officer and the district special education officer were purposively picked and issued with questionnaires. Checklists
were used to collect information on children’s behaviour. In order to understand children’s academic performance, children’s progress records were scrutinized. The instruments validity was ensured through review by the early childhood experts and the reliability was ensured through test retest method with a consistency of 0.80 established. Permission from NACOSTI was sought before data collection. Data collection took 32 days; 3 days per school where observations were conducted first followed by interviews then analysis of the children’s academic progress records and finally administration of the questionnaires. Thematic content analysis with excerpts was used to analyse qualitative data. Descriptive statistics was used to summarise data while quantitative data was analysed through and linear regression. The study established that there is no significant relationship between aggressive behaviours and academic performance. However children with aggressive behaviours have low class participation and task completion. They show poor school attendance but rarely drop out of school. Teachers, DICECE and education officers are not well prepared to handle the children with aggressive behaviours. Children with aggressive behaviours face challenges in their academic progress. There is need for increased funding and research to help these children. Child guidance and counselling programme in schools is highly recommended.

A CRITIQUE OF APPROACHES TO EDUCATIONAL REFORM IN KENYA WITH SPECIAL REFERENCE TO RICHARD PAUL’S THEORY OF KNOWLEDGE, LEARNING AND LITERACY

PAUL KORIR – M.Ed.

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Dr. Francis G. Wokabi

The purpose of carrying out this research is to critically scrutinize the approach to education reform in Kenya utilizing Richard Paul’s theory of knowledge, learning and literacy. The new approach is necessary because the present literature is virtually silent on a specific theory that has consistently guided educational reform in Kenya. What are evident instead are piecemeal reforms with problems recurring after each reform is undertaken. This study analytically scrutinizes two sets of concepts that have influenced educational reform in the recent past: didactic and critical approaches. Our analytical framework, which is Richard Paul’s Critical theory of Knowledge, Learning and Literacy, provides what we consider a viable theoretical tool for guiding educational reform and is used to critique the current reforms in education in Kenya. We believe that a guiding theory is fundamental in attempting to formulate a new approach by
providing new yardstick by which reform should be implemented and evaluated. This study has underscored the need for theory in educational reforms. It has critically examined several theories that might have implicitly influenced educational reform in Kenya since independence. It has been illustrated that the current educational reform in Kenya lacks explicit theories that guide them, hence leaving education stakeholders to rely on unknown or informal educational theories. In the absence of best alternative, people may be persuaded to question the value of any specific approach. An analytical scheme for understanding these reforms has been presented, highlighting how these reforms vary and mentioning specific features of each reform. Our focus is on the importance of explicating a philosophical approach that effectively guides one in reforming education in Kenya and more specifically, to what extent do these approaches provide adequate theory for reforming education in Kenya. Richard Paul highlighted the conflicting nature of didactic and critical approaches, as well as the limitations and often glaring inconsistencies within and among them. Paul asserted that there is need to replace the didactic conflicting, inconsistent and often fragmented approaches to reasoning with systematic and critical approach. The study concludes that a reform approach based a formal theory that is well-developed is more readily available for discussion and examination. Implicit and hidden reform approaches can produce frustration and confusion when the problems of the education system occur.

GENDER DIFFERENCES IN MATHEMATICS PERFORMANCE AMONG SECONDARY SCHOOL STUDENTS IN BURETI SUB-COUNTY, KERICHO COUNTY KENYA

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Dr. Twoli N.W

In all developing countries, mathematics education is being called upon to play an even more important role for the future. For an all round contribution, there is need to involve both men and women. This study focused on the gender differences in performance in mathematics among form three secondary school students in Bureti Sub-County. It focused on the influence of students perception, parental expectations, teachers’ characteristics and perceptions and school environment on their learning of mathematics. The objectives of this study were: (a) to determine the gender differences in achievement in mathematics in secondary schools (b) to establish gender-related factors that influence performance in mathematics (c) to establish the relationship between students career aspiration and their attitude towards mathematics in learning (d) to establish teachers’ perceptions about boys’ and girls’ ability to grasp mathematics concepts (e) to establish best practices adopted by teachers to motivate and encourage boys and girls towards
improvement of mathematics performance in secondary schools. The study was a cross-sectional descriptive survey employing correlation methods to investigate gender differences in Mathematics achievement levels of girls and boys. A total of 430 students responded to a five-item, mathematics Achievement Test (MAT) comprising statistics and probability questions. Descriptive Survey design was used. Data was collected using Mathematics Teachers Questionnaires (MTQ) for teachers, Mathematics Students Questionnaire (MSQ) for students and Mathematics Students Achievement Test. The target population was mathematics teachers and form three students from selected secondary schools in Bureti Sub-County, Kenya. Stratified sampling technique was used to select eight (8) secondary schools: 2 for boys, 2 for girls and 4 for mixed from 54 secondary schools in Bureti Sub-County, Kenya. The study used a sample of four hundred and thirty (430) form three students from the eight stratified and randomly selected secondary schools. Eighteen mathematics teachers teaching the study classes were purposively sampled. Simple random sampling was used to select one stream from each category where there were more than one stream, otherwise the stream was purposively selected. The instruments were piloted to enhance their validity and reliability. Students did a mathematics test. Data obtained from the study were analyzed using SPSS software. The students also responded to the Attitude Scale. The teachers filled the Mathematics Teachers Questionnaire (MTQ) on the reasons for poor performance of students in Mathematics and their possible solutions. The validity and reliability of the instruments were enhanced by a pilot study and the adoption of some already validated items. A reliability coefficient of at least 0.8 was acceptable for the study. The study revealed the following findings; gender was strongly associated with mathematics achievement ($r= 0.9880, p< 0.05$). As a result, boys’ schools performed better than girls schools. Boys had a stronger affinity and interest towards mathematics. Teacher and school factors were of little effect on mathematics achievement with respect to gender. The key recommendation was that measures are needed to be taken as early as possible, probably already in primary education, which aim at the suppression of socialization factors known to lead to the establishment of gender differences in mathematics achievement. It would be desirable to implement strategies in the curriculum as well as in the pre and in-service training which would help moderate gender differences in students’ achievement in mathematics.
A lifestyle that embraces physical activity promotes good health, improved mortality rate, ability to perform personal daily duties with undue strain, enhanced self esteem, improved academic achievement and better late age life. This study explored the perceptions and practices of learners on physical activity. Analysis of the learners’ perceptions on the adequacy of physical activity opportunities in schools, their practices in engaging in physical activities, the schools’ practices in providing adequate environment for physical activity, learners’ constrains in accessing physical activity opportunities in schools and effects of physical activity on academic achievements were the objectives that the study aimed to achieve. The study was modeled along Self-Determination Theory and Ecological Systems Theory. The approach used in this study was mainly qualitative with some limited use of quantitative approach. The study employed a case study methodology to reach an in-depth understanding of the subject matter. The study was carried out within Nairobi County targeting a cross-section of socio-economic strata of low, middle and high class. The study targeted class six pupils. Views about learners were also gathered from teachers and parents. Key Informant Interviews, focus group discussions, pedometers, and observations methods were used in collecting the desired data. Validity and reliability were ensured through piloting and triangulation of data sources. Data was coded according to themes derived from the study objectives. Data was analyzed descriptively and thematically. Findings were presented in narratives and simple statistics. The study indicated that learners had interest in PA/PE. In general, schools had limited facilities and equipment for learners use in PA/PE. Teachers engaged learners in academic work during PE and games sessions. Teachers handling LWSN lacked suitable training and skills to teach adapted PE to these groups of learners. The study found out that only 17% of the PE lessons were taught. Boys engaged more in PA than girls. Boys engaged more in PA in school while girls’ we more active in the home and neighbourhood environment. Learners from the middle SES background engaged less in PA than those from the lower and upper economic backgrounds. Limited time, inappropriate attire, over attention to academic work, risks of injuries and security were issues that learners perceived to hinder their access to PA. 6 out of 10 (60%) top learners in the class academic ranking were found in the upper third of learners best ranked in PA level. The government through the Ministry of Education should create awareness among parents, teachers, learners and others stake holders in education on the need for PA and its significance on academic achievement. Through the Ministry of Health parents, teachers and learners should be sensitized on the importance of PA in health promotion. Line ministries in the government
should develop deliberate affirmative strategies that create barrier free environments for LWSN opportunities in PA.

INFLUENCE OF EDUCATIONAL SUPPORT SYSTEMS ON PARTICIPATION OF ORPHANS AND VULNERABLE CHILDREN IN PRIMARY SCHOOLS IN KALAMA DIVISION, MACHAKOS COUNTY, KENYA

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The aim of this study was to investigate on the influence of educational support systems (ESSs) on participation of Orphans and Vulnerable Children (OVCs) in primary schools in Kalama division, Machakos County, Kenya. This was crucial as OVCs’ school attendance, retention and class concentration was low due to poor educational support. This contradicted the Kenya National policy on OVCs (2005) which stipulates that OVCs have the right to access education. The study was concerned with ESSs namely nutritional, academic and emotional support and their influence on participation of OVCs in primary schools. The objectives of the study were to: Find out the nature of nutritional support and its influence on OVCs participation in primary schools; Establish academic support and its influence on OVCs participation in primary schools; Examine emotional support and its influence on OVCs participation in primary schools and explore intervention measures that can enhance the educational support systems. The study adopted descriptive research design. Simple random sampling technique was used to select 5
public primary schools. Head teachers of the selected primary schools were selected using purposive sampling technique while teachers and regular pupils were sampled using simple random sampling technique. Systematic random sampling was used to select OVCs. Sample size was determined by calculation based on 10 percent of the target population. The sample included: 5 head teachers, 36 teachers, 200 OVCs and 110 regular pupils. The sample size was 351 with 158 males and 193 females. The instruments for data collection were questionnaires, interview schedule, Focus Group Discussions (FGDs) and observation schedules. A test retest method was used to determine the reliability of the research instruments where formula of spearman rank order correlation was used. Validity of the instruments was determined by the researcher. Qualitative data was analyzed by use of content analysis approach while quantitative data was analyzed using descriptive statistics which included the use of excel computer Programme. Quantitative approach was mainly used in this study since most of the data was analyzed in numerical form. The findings of the study were presented on frequency tables and percentages, pie-chart, bar graphs and in narrative form. The findings revealed that the ESSs offered to OVCs were; free primary education, school feeding programmes and guidance and counseling, among others. However, the ESSs were inadequate leading to low participation of OVCs in primary schools. The suggested intervention measures for enhancing the educational support systems for OVCs included; community sensitization on OVCs’ matters and involvement of government towards supporting OVCs. Recommendations were made to the government to support OVCs nutritional needs by ensuring school feeding programmes were operational in all public primary schools and ensure the pro-poor initiatives were reaching all the OVCs so as to meet their basic needs. Community and private organizations were recommended to support OVCs meet their educational needs.

VIOLENT BEHAVIOR AGAINST WOMEN AND IT'S EFFECTS ON THE ACADEMIC PERFORMANCE OF THEIR CHILDREN IN SELECTED PRIMARY SCHOOLS IN KIAMBU COUNTY, KENYA

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Prof. Karugu

The study investigated the effect of violent behavior against women on their children’s academic performance in primary schools in Kiambu County, Kenya. The possible causes and forms of
violent behavior were contributed to drug abuse, others to economic disparities, power struggles within the family and discriminatory cultural norms. Forms of domestic violence identified were cases of physical, psychological, sexual and economic. The effects of exposure to domestic violence included chronic school failure, attainment of below average grades, poor grade retention, absenteeism and school dropouts. The coping mechanisms identified included non-disclosure, seeking help from friends and avoidance. Majority of the schools were found to lack guidance and counseling program to cater for children exposed to domestic violence and even in the schools where there were guidance and counseling program, they lacked capacity to cater for the children from the affected homes. The interventions identified at the school level included creation of good environment where the pupils felt free to express their experiences without feeling intimidated, creation of adequate communication flows, training of teachers on special education for proper handling of learners and sensitization of parents on the adverse effects on domestic violence on the welfare of the children as well as special training for law enforcement officers on handling domestic violence. At the policy level, children rights and welfare officers visited the affected homes in the company of law enforcement officers and sought the best ways of rescuing and assisting children and the affected women. However, inadequacies in the legal framework were cited in that the officers were not empowered to carry out investigations or prosecute cases of domestic violence but had to rely on the law enforcement agents such as the police who at times did not understand the impact of domestic violence on the children’s welfare. Based on the findings, the study recommended that elaborate ways of protecting, identify, screening and assisting children from homes affected by domestic violence should be put in place both at school and community level. More research needs to be devoted to other adverse effects of domestic violence on children such as emotional, mental, psychological and physical effects of domestic violence on children as well as the direct victims.
COMMUNITY RESOURCES when used in teaching and learning enhance understanding and retention. This study examined the availability and use of community resources in teaching Business Studies in secondary schools in Ruiru District Kiambu County Kenya. A descriptive research method was adopted. A sample of 10 principals, 10 Business Studies teachers and 100 students was drawn from a target population of 1222 respondents. Data was collected using interview schedule for Principals and questionnaires were used to collect data from teachers and students. Information was collected from twenty two secondary schools in Kiambu District. Descriptive statistics in form of percentages, frequencies, tables and ranks were used to analyse data. Major finding of this study were that community resources were not regularly used in Kenyan secondary schools due to constraints of time, finance etc. The study also revealed that the respondents were conversant with community resources in their District. From the findings teachers should try as much as possible to use community resources in teaching Business Studies. This will improve the quality of instruction in schools and ensure student active involvement in life-like learning activities.

USE OF MODERN ASSISTIVE TECHNOLOGY AND ITS EFFECTS ON EDUCATIONAL ACHIEVEMENT OF STUDENTS WITH VISUAL IMPAIRMENT AT KIBOS SPECIAL SECONDARY SCHOOL KISUMU COUNTY, KENYA
Modern assistive technology can move a long way in improving the quality of special education through making students with special needs more independent. Analogy assistive technology which is mainly used in Kenyan special school is slow, bulky, inefficient and dependent. Therefore, the purpose of this study was to analyze the potential of modern assistive technology in educational achievement for students with visual impairment at Kibos special secondary school. The study employed a case study research design where both quantitative and qualitative data of one special school were collected and analyzed. The target population of 133 students with visual impairments comprised of 73 boys and 60 girls. The study also targeted 10 teachers, a transcriber and a librarian. The study employed purposive sampling technique to select a sample of 40 students, 10 teachers, 1 librarian and 1 transcriber. Research instruments were questionnaires, interview schedule and observation checklist. Research findings were presented using frequency tables and percentages. The study revealed that in Kenya students with visual impairment use analogy technology which embraces manual brailers, slate and stylus, abacus, Taylor Frame, cubes and Cuberithms Board which are slower, inefficient and not matching digital age. The study also found that: use of modern assistive technology has enormous contribution on curriculum coverage and early completion of class work and assignments, assistive technology was in use at Kibos special secondary school in a computer laboratory where computer lessons were being conducted. Braille machines were the most frequently used types of assistive technology followed by computers, I pads and tablets. Functional vision was the most important factor considered when selecting any kind of assistive technology, and the limited number of computers was the greatest notable challenge because sharing of machines among the visually impaired is not beneficial possible due the sensory lose. The study recommended that the Ministry of Education should recognize the potential of assistive technology in supporting education for students with VI, schools for VI schools be equipped with modern assistive technology which is less bulky, quick, easier efficient, motivating and that encourage independent study/learning. Teacher empowerment is necessary to ensure adequate computer literacy skills to deliver adequately to students with visual impairment and teachers, parents, guardians and all stakeholders of institutions dealing with students having visual impairments be sensitized about the enormous benefits that come with modern assistive technology.
This study was undertaken with the aim of providing information on the levels of ability of the students of secondary schools on reading comprehension in English language in Vihiga District in Western Province of Kenya. It was meant to determine the factors that influence reading comprehension, the knowledge they have about reading comprehension skills, reading activities organized for their own reading development and problems they encounter in reading and answering questions in reading comprehension. Few studies have been carried out on the strategy students use to answer comprehension questions in English and comprehensions still present a number of problems to students at the KCSE level as evidenced in the final scores over the years. Vihiga district was selected for the study mainly because the schools from the district have consistently performed poorly in English at National examinations. The mode of answering questions in reading comprehension could be one of the factors contributing to this poor performance. In addition, the study investigated the relationship in performance between boys and girls in answering reading comprehension questions. A sample of six hundred and seventy eight (678) students and fifty (50) teachers in sixteen (16) randomly selected secondary schools were selected. Two main instruments were used in this study. The first was a reading comprehension passage for students to determine the problems they encounter. The second instrument was a teacher questionnaire to draw out some highlights about procedures and skills teachers use in teaching reading comprehension. The instruments were piloted and adjusted as necessary before the main study. The data from the main study was analyzed mainly using descriptive and basic statistics, which are the means, frequency distributions and percentages.
The data was interpreted, discussed and recommendations made. The main findings from the study indicate that teachers experience limited reading materials in schools and this seems to impact on reading habits and competence of learner’s comprehension. The overall performance as the comprehension test was rather average and in terms of gender the boys (x=59.53%) performed slightly better than girls (x=56.56%). The comprehension skills showed varying performance. The skills on word reading, word context, multiple strings, making judgment and metaphor interpretation were performed better than those on literal abilities, inference and salient ideas. The students showed some potential and with adequate support in resources and instructional techniques there can be improvement. Some recommendations were made for further studies especially in the area of further exploration of other comprehension skills such as those associated with cloze tests.

INFLUENCE OF PARENTS’ SOCIO-ECONOMIC STATUS ON THEIR PARTICIPATION IN CHILDREN’S PRE-SCHOOL EDUCATION IN KAYOLE, NAIROBI COUNTY, KENYA

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Supervisors: Dr. Mary Ndani
Dr. Maureen Mweru

Over the recent years, parental participation in their children’s education has been centre of focus at different fora including research. More studies have been done in relation to parental level of participation and how they influence with their children’s education but limited studies have focused on how parents’ socio-economic variables contribute positively to their participation in pre-school children’s education. The purpose of this study was to investigate the influence of parents’ socio-economic status, education, occupation and income) on their level of participation (communication, decision making and collaboration) in pre-school children’s education. Strategies used by schools to enhance parental level of participation in their children’s preschool education were also investigated. The study was guided by Abraham Maslow’s theory of motivation and Epstein “model” of parental participation. A descriptive survey design was employed. All preschool teachers and parents in Kayole Zone, Nairobi county were targeted of which sample size was obtained. A simple random sampling procedure was used to get 35 preschool teachers and 120 parents. Questionnaires for preschool teachers and interview schedules for parents were data collection instruments. Validity and reliability was established during the
pilot study in two schools, where a Cronbach’s alpha of 0.8 was obtained to check the consistency of results. Data was analyzed using frequencies, descriptive statistics and chi-square tests to show the association (p<0.05 at 95 % confidence level) and their effect on outcome variables. Results show that parental level of education and income had positive association with their level of participation in pre-schools. Parents with higher level of education have relative higher level of parental participation in pre-schools. Parents’ occupation was however found to be unrelated to the level of parents’ participation in their children’s preschool education. The study concluded that education, occupation and income of parents have influence on their participation in preschool education of their children. Enhancing education levels, increasing income levels and creating employment opportunities for parents will boost their level of participation in preschool education of their children. Further research, a more specific study needs to be carried out focusing on other factors such as childhood nutrition, primary health care, gender mainstreaming, forceful migration relate to preschool education in Kayole and other places in Kenya.

CHALLENGES FACING TRANSITION OF LEARNERS WITH INTELLECTUAL DISABILITY FROM SPECIAL SCHOOLS TO WORK IN NAKURU COUNTY, KENYA

HANNAH N. MAINA – M.Ed

Department: Special Needs Education

Supervisors: Dr. Jessina Muthee,

Dr. Catherine G. Murungi,

The purpose of the study was to investigate what determines transition of the learners with intellectual disability from special schools to work. The objectives of the study were to find out transitions plans in curriculum, investigate preparedness of the learners with intellectual disability for transition, find out what determines graduation readiness; and establish the engagement of the learners with intellectual disability by the employers after their training. The researcher adopted the Piaget’s theory that deals with the nature of knowledge itself and how human beings acquire, construct, and use it. The study was conducted at Nakuru Hills and Pangani special schools for the learners with intellectual disability in Nakuru County. The target population was two hundred and twenty eight (2 Head teachers, 30 teachers, and 196 parents) where thirty two (2 head teachers, 10 teachers and 20 parents) were sampled for the study. The researcher conducted a purposive sampling of schools as well as the head teachers
and simple random sampling of the teachers and parents for equal chances of inclusion in the sample. Piloting was conducted at Njoro special school for the learners with intellectual disability. The researcher used questionnaires to collect data. The researcher administered the research instruments to the respondent by visiting the sampled schools. The quantitative data collected was analysed using simple descriptive statistics by percentages. The main findings were that transition from school to work in the two special schools is not given much attention hence having over aged learners in the school, inadequate teaching and learning resources aimed at preparing the learners for life after school, majority of the teachers teaching in this schools are not specially trained in the area of intellectual disability and lack of a inter disciplinary transition teams in the schools. The study recommends that the government through the ministry of education should pay attention to the current and future needs of learners with intellectual disability to enable them transit from school to work with ease. The major conclusion is that the learners with intellectual disability are inadequately prepared for transition. The study recommends another study be done to investigate government’s involvement in facilitating transition of the learners with special needs and disability in the special schools

UTILIZATION OF INSTRUCTIONAL RESOURCES IN TEACHING PRACTICAL GEOGRAPHY IN SECONDARY SCHOOLS IN KIPKELION SUB-COUNTY, KERICHO COUNTY-KENYA

LANG’AT CHARLES – M.Ed

Department: Educational Communication and Technology

Supervisors: Prof. Ondigi Samson Rosana.

Dr. Nasibi .M. Were

Performance of Geography subject in Kipkelion Sub-County has been poor. Over the years, the results have not been satisfactory to the teachers, parents and other stake holders. This prompted the researcher to investigate whether the educators and learners use instructional materials in practical geography. The following objectives were used in the study, to establish the utilization of instructional resources for Practical Geography, investigate extent the teaching and learning resources are used, establish the views of the teachers and students towards use of instructional resources, and establish the challenges faced by teachers when teaching Practical Geography. The theoretical framework of the study was based on Edgar Dale’s cone of experience. The study design used was descriptive survey. The study population comprised of Geography Heads of
Department (HOD’s), teachers and students in secondary schools. Simple and random sampling techniques were used in selecting the research participants. This included a sample of 5 schools, 300 students, 5 Geography HOD’s and 10 Geography teachers. Students and teachers’ questionnaire, interview schedule and checklists were used in data collection. Analysis of data was done using both descriptive and inferential statistics. Descriptive statistics such as include frequencies and percentages. The collected data collected was coded and analyzed using Statistical Package for Social Science. Descriptive and inferential statistics was used in data analysis. The results showed that 70 % of the schools had instructional materials yet only 22.5% of teachers utilize these resources while more than three quarters rarely or never utilize instructional materials. Majority of Geography teachers had poor attitude towards utilization of instructional materials. The study also revealed that Maps were the most utilized resources in classrooms, the least utilized being radios and dioramas. The study recommended that school management and administrators should improve instructional resources for teaching and learning practical geography by availing computers, geography teachers should be enlightened on the importance of utilizing instructional resources in teaching and learning practical geography teachers should be motivated in order to change their negative attitude toward utilization of instructional resources. Learners should be encouraged through field trips around the school and beyond and lastly the geography syllabus ought to be reviewed and also a number of lessons increased from three lessons to four per week and to five lessons in the upper classes.

DETERMINANTS OF SOCIAL INTERACTION AMONG AUTISTIC CHILDREN AT HOME AND UNITS FOR THE INTELLECTUAL DISABILITY, KITUI CENTRAL SUB-COUNTY, KENYA

PATRICIA KAMENE MUSEMBEI – M.Ed

Department: Special Needs Education

Supervisors: Dr. J.M. Muthee

Prof. G. Karungu

The purpose of this study was to investigate the determinants of social interaction (SI) among children with autism at home and special units for the intellectual disability in Kitui Central Sub-County, Kenya. The researcher sought to identify the autistic characteristics, investigate the school factors, determine home factors, and establish intervention strategies influencing social interaction among these learners. The study adopted descriptive research design, guided by the social Exchange Theory (Kozloff, 1973). Purposive and simple random sampling were used to select a target population of 214 and a sample size of 89 participants, that is 4 head teachers, 25 assistance teachers, 30 Children With Autism (CWA) and 30 parents of CWA. The pilot study was conducted at Tulia special unit Questionnaires were used to collect data from teachers,
interview schedule from parents with research assistants and observation checklist on children with autism, behavior and surrounding environment. Reliability and validity of the instruments was measured by use of content validity and test-retest method. Qualitative data using open ended questionnaires would be reported verbatim. Quantitative data obtained using closed-ended questionnaires was analyzed using Statistical Package for the Social Sciences (SPSS-X) and presented in form of graphs, tables and charts. The CWA had communication difficulties which affected their social interaction and that CWA had social interaction difficulties with teachers and peers. The study also revealed that school factors influencing the social interaction of CWA includes; social play, social games, teachers attitude, songs and dance, labelling of others and social skills. Parental poverty, parents’ attitude level of Education, and social economic status greatly influence social interaction among CWA. Some of the intervention measures used by teachers/parents to enhance social interaction among autistic children includes; peer mediation, parent involvement/ appropriate learning and play material, reciprocal imitation and integrated play. The recommendations are; the government should provide schools which have CWA children with adequate facilities which can enhance their social interaction. The teachers taking care of the CWA should be frequently in-serviced with the current skills of handling special children. All parents irrespective of their social economic status should be encouraged to take their CWA condition to school. The society should be sensitized on accepting CWA so as to change their attitude towards children with special needs.

SOURCES OF STUDENTS’ ERRORS AND MISCONCEPTIONS IN ALGEBRA AND INFLUENCE OF CLASSROOM PRACTICE REMEDIATION IN SECONDARY SCHOOLS MACHAKOS SUB-COUNTY, KENYA

MARY MBATHE MULUNGYE – M.Ed

Department: Educational Communication and Technology

Supervisors: Dr. Miheso O”Connor
Dr. Sophia Ndethiu

This study sought to examine the various errors and misconception committed by students in algebra with the view to exposing the nature and origin of the errors and misconceptions in secondary schools in Machakos district. Teachers” knowledge of students” errors was investigated together with strategies for dealing with them. The various teaching methods and
how they contribute to the alleviation of the errors were also investigated. The underlying theoretical view of learning was constructivist, namely that students commit errors in the course of their efforts to construct meaning within mathematical situations. According to Merriam & Ceffarella (1999) “Meaning is made by the individual and dependent upon the individuals” previous and current knowledge structure”. Therefore to make sense of a new material the individual will have to use the existing knowledge. Descriptive survey design was adopted and carried out in fifteen out of one hundred and forty two schools in Machakos district. The study used a sample of four hundred and thirty form two students and fifteen mathematics teachers of the respective classes at the time of the study. Data comprised of the results from mathematics students tests (MST), student interview schedule (SIS) and mathematics teachers” questionnaire (MTQ). The validation of the instruments was done in one randomly selected secondary school which was not included in the main study. The data collected was coded and analyzed using descriptive statistics. This involved organization of statistical data in form of frequency distribution tables, whose explanation was mainly descriptive. The findings indicated that the students make errors and that they have misconceptions in algebra. The findings of the study indicated that most (63%) students experienced difficulties with the word problem while equations had the least percentage (22.3%) of errors. Variables and expressions had percentage errors of 39.6% and 40.9% respectively. The results also revealed that mathematics teachers were aware of the errors that the students make. The prediction of the errors in this study was a manifestation of how well aware teachers are of students errors and misconception in algebra. As a result the teachers did make attempts to counteract such errors in algebraic class. However only38% of the teachers diagnosed difficulties and misconceptions involved while 62% of the teachers were interested in assessing manipulations. This shows that though the main purpose of
this study was to identify errors that would inform classroom instruction the error/misconception identification did not necessarily lead to instructional strategies that address students’ difficulties. The major difficulty seems to lie with the teachers’ ability to make use of the knowledge they have on student error, rather than their awareness of the errors. This reveals that there are deficiencies in the teaching of algebra. Teachers will need assistance not only in error identification but also how the error would be built in the whole process of learning. More emphasis should be put on students’ understanding of the algebraic concepts in order to eliminate rot learning and cramming which contribute to most of these errors. To enhance teachers’ use of student’s experiences, teacher education will need to focus on encouraging a variety of ways of teacher-student interaction during which students’ mathematical ideas should be considered exhaustively.

INFLUENCE OF PRACTICAL APPROACH OF TEACHING ON STUDENT ACHIEVEMENT IN GEOMETRY IN PUBLIC PRIMARY SCHOOLS IN THOGOTO ZONE, KIAMBU COUNTY, KENYA.

MWANGI PETER GACHOKA – M.Ed

Department: Educational Communication & Technology

Supervisors: Dr. Marguerite Miheso-O’Connor

Dr. Sophia M. Ndethiu
Over the years poor performance has consistently been observed in geometry. Geometry has an important place in primary school mathematics curricula. This study aimed at establishing the influence of practical approach on achievement in geometry in public primary schools in Thogoto zone, Kiambu County. The main objectives of the study determined the extent which mathematics teachers use the practical method. The study also established resources used, effects and errors and also investigated teachers and pupils’ attitudes towards geometry. This study was carried out in public primary schools in Thogoto educational zone, Kiambu County. The zone had twelve public primary schools with total population of 1035 pupils and 24 mathematics teachers. In this study one school was used for piloting and four other schools were used for the main study. Quasi experimental research and cluster sampling method were used. Four schools were randomly sampled from four clusters making up the zone. Three hundred and forty three pupils and eight teachers were randomly sampled from four schools sampled. Geometry standard tests and questionnaires were used to obtain data. Standard seven mathematics syllabuses content on geometry were analyzed to form ten questions. Geometry standard tests were administered to all standard seven pupils before and after teaching. Teaching and learning methodology data, gathered using teachers and pupils questionnaires. Data analyzed using excel and statistical package for social sciences (SPSS version 2.0). Frequency tables, graphs and pie charts were used. Findings showed that mathematics teachers within Thogoto zone used variety of methods while teaching geometry. There was general consensus among teachers that use of teaching/learning resources improved teaching. T-Test analysis showed significant effect on performance when using practical approach. The critical value at p < 0.05 using 2-tailed t-table i.e. p (T > b) = α/2 with degree of freedom (df) = 298, b was 1.960 where α was infinity. The critical value at 10% significance level was 1.282, which was 10% in each lower and upper tail. The critical value at 5% significance level was 2.326 and 2.576 at 1% significance level. Findings indicated four conclusions. First, use of practical method in teaching geometry was very low, secondly, practical teaching was more effective method of teaching than other classroom teaching methods, thirdly, geometrical concepts that relates to shapes were easily understood by pupils and lastly, teachers and pupils had both positive and negative attitudes towards geometry teaching. The study recommended that, ministry of education should target to incorporate practical teaching of geometry in primary schools through SMASE program, emphasizing on improvisation of teaching and learning resources, organizing in-service training on syllabus interpretation and applications of practical approach in teaching, focusing on enhancing teachers understanding on practical teaching and improving creativity and attitude change in geometry teaching and learning.
What constitutes quality preschool education from the perspective of parents? Are there features that they consider inherent in preschool programs perceived to be of good quality? This study was carried out to establish preferences of parents on quality preschool education in Athi river sub-county, Machakos County. The study explored parents’ preferred preschool learning conditions, teacher practices and learning competencies children ought to attain at the end of the preschool period. In addition, the study examined the extent to which parents’ demographic characteristics influenced their preferences on quality preschool education. The study was guided by the rational choice theory which argues that in principle, rational individuals have perfect knowledge on various issues and it is such knowledge which shapes their preferences. In documenting parental preferences, a descriptive survey design was adopted. The respondents of the study were 114 parents, 14 preschool teachers and 14 head teachers. All the respondents were drawn from 14 public preschools distributed across Lukenya and Athi river divisions of Athi river sub-county. Data collection instruments employed were questionnaires for parents and interview schedules for the preschool teachers and head teachers. To ascertain validity and reliability of instruments, a pilot study was undertaken in one preschool located in Lukenya division. Test retest method was employed to compute reliability measure of instruments using Cronbach’s coefficient alpha. The reliability coefficient of the subscale items on the learning environment, teacher practices and preferred learning competencies was 0.796, 0.922 and 0.912 respectively. This implies that the instruments were reliable. Statistical package for social sciences (SPSS) spreadsheet was prepared for entry of quantitative data which was analyzed by running frequencies and doing correlation analysis on various variables. Qualitative data was transcribed, analyzed thematically and reported in form of verbatim quotations and narrations. Findings revealed that nearly all parents preferred preschool classes with lower teacher: child ratios and those equipped with a variety of learning materials and activity corners. On preferred teacher practices, majority of the parents (72.1%) were in favour of teaching literacy and numeracy skills. Basic reading, writing and numeracy skills were rated as the most preferred learning competence at 89.4%, 86.2% and 84.8% respectively. Using a correlation analysis, the study established that there was a statistically significant correlation between highest level of education attained by the parents and their preferences on quality preschool education, \((r = .568, p = .000, \text{with } R^2 = 92.516)\). On the other hand, there was no statistically significant correlation between parents’ age \((r = .126, p = .234, \text{with } R^2 = 13.69)\), gender \((r = .176, p = .000, \text{with } R^2 = 92.516)\).
A major conclusion from the study is that majority of parents have a clear and nearly common understanding on what constitutes quality preschool education. The study recommends that parents should be actively involved in formulation and implementation of preschool education policies since they are equally critical stakeholders that can no longer be ignored. In addition, the study recommends that quality assurance officers at district level should encourage preschool teachers to promote holistic development of children instead of emphasizing only in academic areas. Further, the study also recommends further research to establish the impact of parental preferences on preschool curriculum implementation.

LEARNING RESOURCES AND STUDENTS’ ACADEMIC PERFORMANCE IN GEOGRAPHY IN MAKUENI COUNTY, KENYA

STEPHEN MUNGUTI – Ph.D

Department: Educational Management, Policy and Curriculum Studies
Supervisors: Prof. John Aluko Orodho
            Dr. Levy Libese

This study investigated the relationship between learning resources and students’ academic performance in geography in KCSE in public secondary schools in Makueni County. The objectives of the study sought: to establish the variety of learning resources used in the teaching and learning of geography in public schools in Makueni County and their effect on KCSE performance in the subject in the county; to find out the availability of learning resources for the teaching and learning of geography in public schools in Makueni County and its effect on KCSE performance in the subject in the county; to establish the use of learning resources in the teaching and learning of geography in public schools in Makueni County and its effect on KCSE performance in the subject in the county; and to find out the relationship between teacher training on learning resources and its effect on KCSE performance in geography in public schools in Makueni County. The study was guided by the Classroom Instruction Theory using the descriptive survey design. Both stratified and simple random sampling methods were applied in drawing a sample. Data was collected from 422 respondents who included 29 principals, 30 teachers of geography and 363 Form Three students. Data was collected using questionnaires and an observation checklist. Questionnaires were used to collect data from principals, teachers and
students. The observation checklist was used in observing geography lessons. Both descriptive and inferential statistics were used to analyse quantitative data and included means frequencies, cross-tabulations, percentages, correlation and regression analysis. Qualitative data analysis was done using a mixed method of case by case analysis as well as cross case analysis. The findings of the study were: correlation between availability of learning resources and performance in geography at 0.401; correlation between the use of learning resources and geography performance at 0.631; correlation between variety of learning resources and performance in geography at 0.196 and finally, correlation between training of teachers and KCSE performance in geography at 0.197. Null hypotheses on variety, availability and use of resources were rejected while null hypothesis on training of teachers was adopted. The study therefore concluded that while access to variety of learning resources, availability of learning resources and use of resources in the teaching and learning process promoted academic performance in geography in KCSE in public secondary schools in Makueni County, pre-service teacher training on learning resources did not. Recommendations made were: to sensitize teachers to be innovative; teachers to use a variety of learning resources in teaching; school heads to encourage their teachers to attend in-service training; MOE and TSC to ensure further training opportunities to teachers; the content of training opportunities like symposia and workshops to be scrutinized and areas of weakness identified and strengthened; and finally, the use of emerging technology, especially ICT given more consideration in teaching/learning geography. Recommendations for further research were: duplicating the research to probably cover all of Kenya; establishing the content of the symposia and workshops, their usefulness to teachers, what can be done to improve their usefulness; and finally, conducting a multivariate study relating performance in geography with entry behaviour of learners into secondary school and use of learning resources in teaching/learning be conducted.
TEACHERS PERCEPTION TOWARDS HEAD TEACHERS INSTRUCTIONAL SUPERVISORY PRACTICES IN INTEGRATED PRIMARY SCHOOLS IN THARAKA SOUTH SUBCOUNTY, KENYA

DORIS KATHAMBI NJERU – M.Ed.

Department: Special Needs Education

Supervisors: Prof. Karugu Geoffrey

Dr. Chomba Wamunyi

The purpose of the study was to assess the teachers’ perception towards head teacher’s instructional supervisory practices in integrated public primary schools in Tharaka South sub-county, Kenya. Specifically the study sought to; find out teachers perception regarding policy supporting supervision of instruction, establish the aspects of instructional supervision teachers want practiced by head teachers, determine the systemic challenges likely to affect supervision of instruction, and to assess SNE teacher’s perception on supervision of instruction by head teachers. The study was based on role theory and a conceptual framework has been developed.

The research design for the study was descriptive research survey, and target population was the 50 integrated public primary schools in Tharaka South sub-County. A sample of 20% of the target population was selected. The head teachers, teachers and the quality assurance officers were the respondents. Questionnaire tools were used to gather the required information. The Cronbach Alpha was used to test internal consistency of the items in the questionnaire. The statistical package for social scientists (SPSS) was used to generate the Descriptive statistics that were used to analyze the quantitative data. Qualitative data was reported thematically in line with the objectives of the study. It was established that some of the Head teacher and teachers were not acquainted with the 2008 TSC policy on identification, selection, appointment, development and training of head teachers. There exists a variance in the way respective head teachers approach the teaching policy in their respective schools, systemic challenges existed in the integrated public primary schools in the sub-county and they affect supervision of instruction, and while supervision of instruction was an effective tool for head teachers, its approach inhibited teachers’ performance. It was recommended that TSC circulates enough copies and organises workshops for QASOs, head teachers and teachers on the provision of the TSC (2008) policy, Ministry of Education provide in service courses on administration of schools to teachers upon their promotion to headship positions, that the TSC and the ministry of education provide in service courses for existing head teachers on objective approaches and strategies to supervision of instruction, and that the ministry of education addresses the inefficiencies in the reporting structures for instructional supervision further research was suggested on teachers’ motivator and demotivators in the process of instructional supervision, conflict of interests that
head teachers QASOs and teachers face while discharging their duties, determinants of corruption in public primary schools and forms of stakeholder interference that head teachers QASOs and teachers face while discharging their duties in integrated primary schools in Tharaka South Sub County.

INFLUENCE OF TEACHER-PUPIL RATIO AND AVAILABILITY OF READING MATERIALS ON READING ACHIEVEMENT LEVELS OF STANDARD THREE PUPILS IN KENYENYA SUB-COUNTY, KISII COUNTY, KENYA

OBUNGA ELIJAH ORANGI – M.Ed.

Department: Early Childhood Studies

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Dr. John Ng’asike

Reading ability is one of the basic requirements which enable people to engage themselves successfully in their daily activities. Reading achievement determines the child’s success in school and eventual career development. Despite this, there are low reading achievement levels among standard three pupils. The purpose of this study was study the influence of teacher-pupil ratio and availability of reading materials on reading achievement levels of standard three pupils in Kenyenia Sub-County, Kisii County, Kenya. The study was guided by the following objectives: to establish reading achievement levels of standard three primary school pupils, to establish the influence of pupil-teacher ratio, text books-pupil ratio, story books- pupil ratio and charts-pupil ratio on reading achievement levels of standard three primary school pupils. This study was guided by Lev Vygotsky’s sociocultural theory. Descriptive survey and correlation research designs were used. The independent variables included pupil-teacher ratio, text books-
pupil ratio, story books- pupil ratio and charts-pupil ratio. The dependent variable was the reading achievement levels of standard three pupils. Cluster and simple random sampling methods were used in this study. The population for this study comprised of all primary school and all standard three primary school pupils out of which 65 primary schools were sampled for observing reading materials and 355 standard three pupils were sampled for testing reading ability. The validity of English reading test was established by concurrent validity and the validity of the observation schedule was achieved by item review. The researcher used inter-rater (inter-observer) method to determine the reliability of the observation schedule which was found to be +0.85 using the Cohen”s Kappa index. The test re-test method used to test the reliability of the reading test was found to be +90. Quantitative data was collected from reading test and observation schedule. The data was presented using frequency tables and analysed using chi-square, simple regression and multiple regression using SPSS version 20 computer software. The major findings indicated that majority of standard three pupils were at word level; there was a significant relationship between pupils” reading achievement levels and pupil-teacher ratio, textbook-pupil ratio, story books-pupil ratio and charts-pupil ratio. In the recommendations, the ministry of education should organise refresher courses to equip teachers with reading literacy skills in order to assist pupils acquire reading competency, there is need for the government through Teacher Service Commission to increase the number of teachers in primary schools, ministry of education should provide policy guidelines on the development of teaching and learning resources. Also, teachers should improvise own ways of helping children to acquire reading skills. Teachers should initiate book harvesting programme where they will engage different stakeholders to collect new books for their schools and should develop reading charts from locally available materials. Further research should be conducted at pre-primary school
level which is the foundation for developing reading skills in the learners to unearth the possible school level challenges.

Ph.D

RELATIONSHIP AMONG SCHOOL TYPE AND SECONDARY SCHOOL STUDENTS’ SELF-ESTEEM, ACADEMIC ACHIEVEMENT AND CAREER ASPIRATIONS IN NAIROBI COUNTY, KENYA

KITHELA SHADRACK MUNANU- Ph.D

Department: Educational Psychology

Supervisors: Dr. Theresia K. Kinai

Dr. Dinga Jotham Ndolo.

This study purposed to investigate how school type was related to self-esteem, academic achievement and career aspirations of secondary school students. Students’ are admitted into different school types based on the criteria of their marks in KCPE. There is a lot of stereotyping on “school labels”. National schools post best KCSE grades, making them institutions of fame and prestige, followed by extra-county, county schools and at the bottom are sub-county schools, producing the bulk of poor grades. The implication is that most students in the last category miss qualification to professional careers. This categorization could affect one’s self-realization, influencing self-esteem, academic achievement and career aspirations. Studies have not
adequately addressed this issue. Self-concept Theory by Carl Rogers and Social Cognitive Theory by Albert Bandura guided the study. Nairobi County formed the location of the study. The target population was public students in the form 4 class. There were 79 public secondary schools in Nairobi County at the time of the study (7 were national, 16 were extra-county, 7 were county and 49 were sub-county schools). Cluster and purposive sampling techniques were used to get 12 schools out of the 79 in the former 8 constituencies. From each school, a random sample of 40 students of one form 4 class was drawn (12x40=480 students). The study used correlation design. Questionnaires with standardized scales for students and class teachers were used in data collection. Instrument’s validity and reliability was established during pilot study, using Cronbach alpha. Inferential and descriptive statistical analysis used Statistical Package for Social Sciences (SPSS). Chi-square tested differences in students’ self-esteem between school types. One way Analysis of Variance (ANOVA) and $\chi^2$ tested differences between school type and students’ academic achievement, and also school type versus students’ career aspirations. Analysis for differences in students’ gender and self-esteem used t-test and $\chi^2$. ANOVA tested self-esteem differences and career aspirations for girls and for boys by school type. The level of significance in rejecting the null hypotheses was at $p<0.05$. Data presentation used frequency distributions and percentages. The study found a relationship that was significant between school type and self-esteem of students ($\chi^2 (6) = 456.56, p = .00$), academic achievement ($f (3,447) = 151, p = 0.00$) and career aspirations ($f (3,447) = 14.69, p =.00$). Most of the students from national and extra-county schools had high self-esteem, and aspired for high professional careers compared to majority of sub-county students’ who exhibited low self-esteem and aspired for low-level careers. High self-esteem students had high academic achievement and vice versa. The major conclusion is that, students’ self-esteem differences may influence academic achievement and career aspirations among schools. It is therefore recommended the need to develop self-esteem enhancement and career guidance programmes in secondary schools, more so in sub-county schools. Also, enhance the image of sub-county schools by heavily investing on learning infrastructures and resources. Expand non-academic opportunities of training to cater for rising number of sub-county school students.

STUDENTS’ AND TEACHERS’ RETENTION PERCEPTION AS PREDICTORS OF SELF-ESTEEM AND ACADEMIC ACHIEVEMENT IN SECONDARY SCHOOLS IN MERU COUNTY, KENYA

NANGITHIA ROBERT MBURUNG’A – Ph.D

Department: Educational Psychology

Supervisors: Dr. Doyne K. Mugambi
Retention is a common intervention strategy often used when students fail to meet minimum standards on academic assessments. It has remained a controversial and highly debated topic in education despite many years of research. In Kenya, there have been mixed concerns both in private and public schools due to teacher and school accountability demands. Although numerous researches have been done on class retention, there is a dearth of local studies on retention perception. This study sought to establish the extent to which secondary school students’ and teachers’ retention perception relates to self-esteem and academic achievement.

Erickson’s Psychosocial Theory formed the logical theoretical basis to explain the study. The study adopted correlation design. The study targeted secondary school teachers and students drawn from Meru County which had 283 public secondary schools. Cluster sampling was used to select 28 public schools; random sampling to select 336 form four students and purposive sampling to select 28 form four class teachers. Questionnaires with standardized scales were used as the main tool for data collection. A pilot study was done to determine the validity and reliability of the instruments. Cronbach coefficient alpha was used to ascertain internal consistency. Descriptive and inferential statistics were used to describe and analyze the collected data. Qualitative data were analyzed thematically. The null hypotheses were tested. The level of significance used in rejecting a null hypothesis was $p < .05$. No significant difference was found between students’ and teachers’ retention perception ($t(183)=.32, p>.05$). Students’ self-esteem had significant correlation with teachers’ perception ($r(26)=.84, p < .05$) as well as with students’ perception ($r(333)=.63, p<.05$). Academic achievement had significant correlation with teachers’ perception ($r(26)=.83, p < .05$) as well as with students’ perception ($r (333) =.79, p <.05$).

Academic achievement correlated positively and significantly with self-esteem ($\chi^2 (18) =492.84,$
A major finding was that students with a positive perception developed a high self-esteem and also attained high academic grades. The major conclusion is that teachers’ and students’ perception have a direct relationship with students’ self-esteem and academic achievement. There is therefore need for educators to avoid forcing students to repeat and rather employ other strategies including individualized remedial programs. If retention has to be used, it must be as a last result when all other measures have failed to work. However voluntary retention should be considered to allow students to catch up with the rest.

DYNAMICS OF JOB SATISFACTION AND RETENTION OF SPECIAL NEEDS EDUCATION TEACHERS IN BASIC SPECIAL SCHOOLS IN SOUTHERN GHANA
FELIX KWAME KUMEDZRO – Ph.D

Department: Special Needs Education.

Supervisors: Dr. Nelly Otube.

Dr. Chomba Wa Munyi.

The study aimed at investigating dynamics of job satisfaction and retention of special needs education teachers in Southern Ghana. Specific objectives included identifying the relationship between compensation and retention, establishing the correlation between leadership styles and retention, describing the extent to which interpersonal relationship predicts retention, finding out any differences in perception of the teachers and investigating problems facing the special needs schools in relation to teachers’ job satisfaction and retention. In an attempt to focus the study, four null hypotheses were formulated and tested and one research question was posed. The study was based on Herzberg’s Two-factor Theory that explains the determinants of job satisfaction and dissatisfaction of employees. This study adopted descriptive correlational survey method, utilizing mixed methodologies in data collection and analyses. The target population for the study was 375 teachers and 14 head teachers drawn from 14 schools within the study area. The study was however conducted in 9 schools which consisted of 5 schools for the Deaf, 3 schools for the Intellectually Challenged and one school for the Blind. Out of 150 sampled teachers, 140 of them and all the 9 head teachers participated in the study with a return rate of 93.3% for the teachers. Multiple sampling techniques were applied to select the sample schools and the respondents. The main instruments for the data collection were questionnaire and interview schedule. Experts reviewed the teachers’ questionnaire to ensure validity whilst pilot testing of the teachers’ instrument yielded a reliability of 0.77. Quantitative data was analyzed descriptively and inferentially and inferential statistical tools such as Pearson Moment
Correlation, Simple Linear Regression and One-Way Analysis of Variance (ANOVA) were used to test the null hypotheses at 0.05 level of significance. Answers to the research question were qualitatively analysed using thematic approach. The findings of the study revealed that there was positive and statistically insignificant relationship between compensation and retention. Also a statistically significant relationship was found between leadership styles and retention of special needs education teachers in Southern Ghana. The study also found that interpersonal relationship was a significant predictor of special educators’ retention. Further findings revealed that there were no statistical significant differences among the three different categories of teacher types in relation to perception about their job satisfaction and retention. Finally, the study discovered that head teachers of special needs schools in Southern Ghana are faced with numerous administrative and management challenges which negatively impact on job satisfaction and retention. The study also recommended that policy makers and stakeholders take actions aimed at ensuring that special educators are compensated accordingly by instituting differentiated financial and non-financial incentive packages for them. The study also recommended that the Ghana education service should be organising frequent in-service training for head teachers to update their knowledge on contemporary leadership styles that are considered to increase retention.

EDUCATIONAL INPUTS AND THEIR IMPLICATIONS FOR OUTPUT IN PUBLIC SECONDARY SCHOOLS IN NYARUGENGE AND NYAMASHEKE DISTRICTS, RWANDA

PHILOTHERE NTAWIHA – Ph.D

Department: Educational Management, Policy and Curriculum Studies

Supervisors: Dr. Mary A. Otieno
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Despite the Rwandan government’s efforts to improve quality of education by increasing the supply of educational inputs in secondary schools, educational output continues to be below international standards. Therefore, the purpose of this study was to determine whether and to what extent the relationship exists between educational inputs and output in public secondary schools in Nyamasheke and Nyarugenge districts. To this end, this study sought to identify educational inputs provided in public secondary schools located in Nyamasheke and Nyarugenge districts, determine the extent to which each educational input provided correlate with educational output, find out the determinants of educational output and explore the strategies adopted by school managers to enhance educational output. This study was guided by Education Production Function theory and it adopted a correlation research design. The target population involved 2248 students, 70 head teachers and 2 district education officers, making a total population of 2320. A sample of 241 students, 21 head teachers and 2 district
Education officers was used. Stratified sampling, simple random sampling and purposive sampling techniques were used to select this sample. Questionnaires for students and for head teachers, document review schedule, and interview schedule with district education officers were used to collect relevant data. Expert judgment and test-retest techniques were used to test instruments” validity and reliability respectively. Descriptive statistics such as frequencies, percentages, means were used to describe the provision of inputs, and Pearson r as well as regression analysis were used to describe the implications of educational inputs for output. Thematic analysis approach was used for qualitative data. The findings were presented in graphs, tables and texts. After data analysis, it was found that educational inputs are not sufficiently provided. It was also found that among endogenous inputs, teacher academic qualification, professional training, experience, availability of library, and laboratory student classroom ratio, are the key predictors of students performance as each of them account for between 41% and 78% of student’s performance. Furthermore, it was found that among exogenous inputs, the key predictors of students” performance are their prior performance and their parental educational level as they explain between 18% and 43% of students” performance. Among financial inputs the study revealed that expenditures on staff, on boarding, and recurrent expenditure are the key predictors of students” performance as their contribution varies between 44% and 62% of school mean performance. It was recommended that the government and other stakeholders should invest more in provision of the key educational inputs to enhance output. It was also recommended that means should be provided to implement the strategies adopted to boost the quality of educational output. Future researchers were recommended to carry out a similar research in primary schools and universities to see if educational inputs provided have the same implications at these levels of education.

PREDICTORS OF TRANSFER OF LEARNING FROM EDUCATION MANAGEMENT TRAINING TO THE WORKPLACE AMONG PRINCIPALS, HEAD TEACHERS AND DEPUTY HEAD TEACHERS IN KIAMBU COUNTY, KENYA

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Transfer of learning is critical to the success and relevance of management training programs. Despite the importance of transfer researchers indicates that significant transfer rarely occurs.
There is also an increasing concern in identifying the key factors that influence positive transfer of learning. This study the learner characteristics, training program design and work environment factors influencing the transfer of learning from the Open Flexible Distance Learning Diploma in Education Management program to the work place. It developed a model on predictors of transfer of learning from the Diploma in Education Management program to the work place. The survey targeted 147 primary and 66 secondary public schools purposively selected from eight sub counties in the County Government of Kiambu. Questionnaires were administered to 213 respondents and 60 of them were randomly selected to participate in interviews. Simple random sampling was used to access 213 primary and secondary school principals, head teachers, deputy principals and deputy head teachers who were graduates of phase 1 of the Open Distance Flexible Learning diploma in education management training program conducted by the Kenya Education Management Institute. Quantitative data were analyzed using percentages, means, principal component analysis and principal regression analysis. Qualitative data was put under thematic areas that were consistent with the research objectives. The study established that the educational management training program was relevant with 74% the variance in transfer of learning being accounted for by variables four principal components, namely training program and workplace design, training delivery methods, quality of curriculum and motivation to transfer. The sequence, structure and quality of the training content were excellent; notifications for enrollment were done well in advance with a majority of the respondents joining to enhance knowledge, skills and competencies. However, training expectations were unclear and follow-up support after the training by was inadequate. The work environment provided opportunities to use knowledge but the rewards and recognition were inadequate. Coworker and organizational support as evident but supervisors support at the work place was inadequate. The key predictors of positive transfer were clear linkage between training and career progression; high quality of training material and joining to enhance knowledge. Improper program sequencing and structuring, low personal motivation to transfer and inadequate opportunities to use knowledge contributed to negative transfer. The study recommended that the training program was relevant but should be redesigned to incorporate learner characteristics, training program design and work environment factors which enhance positive transfer of learning to the workplace. Management training institutes should provide more follow up support to management trainees to increase positive transfer of learning.
The thesis concerns a study on the effects of the teachers’ use of communication techniques for achievement of daily living activities for learners with deafblindness in primary Schools in Uganda. The thesis contains five chapters. That is Chapter one, chapter two, chapter three, chapter four, and chapter five in that order. It aims to identify and describe the extent to which the teachers’ use of communication techniques has had an effect on the learners’ ability to acquire life skills during activities of daily living in selected primary schools in Uganda. The word deafblindness is used throughout the thesis, to imply learners who have both a hearing and visual impairment that necessitates that teacher makes relevant adaptations for the learners to participate in ADLs. The detail of the literature is discussed in chapter two. The study was carried out in two districts, and in two government-aided primary schools from Eastern and Mid-western regions of Uganda. The report adopted a survey research design. A target population of 60 participants and a representative population sample size of 30 participants constituted the study. Purposive sampling technique was used to identify participants who taught learners with deafblindness in the selected Schools of the study. The results were obtained through descriptive analysis using a triangulation approach, by observation, interviews and focus group discussions. Data analysis followed categories and emerging sub-themes from the set objectives. The study embarked on interviews and observations with the teachers during indoor and outdoor ADLs. The theory of Social Interaction and the theory of Language and Communication guided the study. These theories stated that; the elements of language constitute its meaning to include aspects such as the use, context and content and their interconnectivity during interactions and dialogue. A conceptual frame work was developed in relation to literature reviewed. Purposive sampling approach was used to identify study sites and participants. The study is hoped to create
awareness among communities about the education of learners with deafblindness. The findings may benefit educationists and policy makers in the area of learners with deafblindness. Study findings may create awareness among stakeholders who might be of help to fill gaps identified. The study concluded that teachers of learners with deafblindness were not doing well in the area of communication that had an effect on the learners’ participation achievements during ADLs. The study recommends that teachers be encouraged to carry out exploratory visits to Schools of similar settings to enable them share experiences and challenges. Government should allocate reasonable funding to procure adapted teaching and learning materials to support teachers in their work. The Uganda National Curriculum Development Centre and other educational institutions cited in the thesis to embrace flexibility during curricula adaptations and diversity in teacher training.

TEACHERS’ CAUSAL ATTRIBUTIONS AND THEIR PERCEIVED SELF EFFICACY FOR CONTROLLING ADOLESCENT HEALTH RISK BEHAVIORS IN SECONDARY SCHOOLS IN NAIROBI COUNTY, KENYA

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The purpose of this study was to establish teachers’ causal attributions and their perceived self-efficacy in controlling adolescent health risk behaviors (bullying, early sex initiation and
drug/substance abuse). Objectives included establishing: the prevalence of health risk behaviors among adolescents; teachers’ causal attributions for adolescent health risk behaviors; gender differences in causal attributions; differences in teacher causal attributions based on teaching experience; teachers’ perceived self-efficacy; gender differences in teacher perceived self-efficacy; differences in teacher perceived self-efficacy based on teaching experience and relationship between teacher causal attributions and perceived self-efficacy. The study was based on the theories of causal attributions and perceived self-efficacy by Heider and Bandura respectively. A descriptive survey research design stratified random sampling, a population of 1,824 secondary school teachers in Nairobi County, Kenya, a sample of 364 teachers (103 males, 261 females) and a questionnaire whose content validity was determined with the help of supervisors and the School of Education validators were used. Reliability after a pilot study stood at .81 “co-efficient alpha.” Data was analyzed using descriptive statistics, chi-square, ANOVA and t-tests and results presented using tables, pie charts and bar charts. Results include: Bullying prevalence 89%, early sex 94.2% and drug/substance abuse 91.5%. Internal attributions: Bullying - indiscipline 31.68%, superiority complex 17.08%, Early sex - immorality 18.93%, indiscipline 17.80% and Drug/Substance abuse - indiscipline 21.47, stress 17.28. External attributions: Bullying - lack of parental guidance 76.10%, peer pressure 87.78%. Early sex - lack of guidance 96.19%, peer pressure 89.08%, Drug/Substance abuse - Peer pressure 78.46%, poverty 62.77% among others. There were no significant gender differences in teacher causal attributions and attributions based on teaching experience. Majority of teachers had a strong perceived self-efficacy. Bullying: Strong 80.77%, weak 19.23%, Early sex: Strong 68.68%, weak 31.32 and Drug/substance abuse: Strong 70.37% and weak 29.63%. Results showed an insignificant gender difference in: teacher perceived self-efficacy, differences in teacher perceived self-efficacy based on teaching experience and relationship between teacher casual attributions and teacher perceived self-efficacy. In conclusion, teachers make varying causal attributions and have a high perceived efficacy. The findings form a basis for understanding teachers’ ability to control adolescent health risk behaviors. To facilitate teachers’ control over adolescents’ health risk behaviors, their understanding of causal attributions and perceived self-efficacy must be enhanced.

IMPLEMENTATION OF SOUTHERN AFRICAN CONSORTIUM FOR MONITORING EDUCATION QUALITY RECOMMENDED STRATEGIES IN LITERACY AND NUMERACY IN FOUR SELECTED DISTRICTS IN KENYA

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Education is recognized as one of the drivers of economic and social development. However, millions of children who attend school do not acquire essential knowledge and skills. Studies done on strategies to improve pupils’ literacy and numeracy skills vary due to diverse country conditions and differences in implementation. The purpose of this study was to investigate teachers’ views about in-service training and utilization of instructional materials in improving pupils’ literacy and numeracy skills. The study was carried out in four selected districts in Kenya: Kitui, Gatanga, Transmara and Migori. The population of the study was 574 public primary schools (254 in Kitui, 167 in Transmara, 102 in Migori and 51 in Gatanga), 574 headteachers and 574 teachers of class three. A sample of 68 primary schools was sampled using both stratified proportionate sampling and random sampling techniques. All 68 headteachers of the sampled schools became automatic respondents. Class three teachers in the 68 schools were sampled. In cases where there was more than one class three, simple random sampling technique was used to sample one class three teacher. Three instruments namely: Teachers’ questionnaire, headteachers’ interview guide and classroom observation guide were utilized. Validity of the instruments was ensured through content validity while the reliability was determined by using internal consistency method. All instruments were piloted before data collection. The qualitative data was analyzed thematically while the quantitative data was analyzed using descriptive statistics such as frequencies and percentages. The findings are presented in tables. It was found that teacher’s attended in-service training through workshops. The useful areas covered in the workshops included literacy and numeracy content, lesson preparation, teaching methods, improvisation of teaching resources and handling pupils’ diversity. The sampled schools had purchased instructional materials and teachers utilized them mainly as reference material, used for guiding pupils to copy literacy and numeracy exercises in their exercise books, writing work on the blackboard for pupils to do or copy, given to pupils to read and do simple arithmetic on their own, observing examples, given to pupils to do homework; and finally used as learning resources. Among the main challenges teachers faced in improving lower primary pupils’ literacy and numeracy skills were high pupil enrolment, inadequate instructional materials, lack of funds, absenteeism, presence of over-age pupils, long distance covered to school, non repetition of pupils, lack of feeding programme in schools and diversity of pupils. To improve lower primary pupils’ literacy and numeracy skills, the study recommends provision of adequate instructional materials. The government, through Ministry of Education should organize regular teachers’ in-service training. The study will be important to pupils’ literacy and numeracy skills firm foundation developed. Teachers can apply SACMEQ strategy in various curriculum areas because literacy and numeracy skills are integral in all learning areas and across all years of education level. Finally, community outcry over low pupils’ achievement will cease when pupils literacy and numeracy skills improve.
Integration of ICT in education is embraced all over the world and Kenya is not exceptional. This study was therefore concerned with teachers’ preparedness in integrating ICT in training teachers in public teacher training colleges. The rationale was based on the view that properly designed, learning materials inspired by integration of ICT and delivered by technology add value to a teaching environment in which contact hours are limited. The curriculum needs academic standards and the development of digital age skill for the 21st century learners if vision 2030 and beyond education goals have to be realized. The literature review focused on the meaning of ICT, Global ranking on integration of ICT, Global overview of ICT use in education, Integration of ICT in Africa, Status of integration of ICT in education in Africa, Readiness in the integration of ICT in Kenya, Integrating ICT and education in Kenya, the rationale for integrating ICT in education, and challenges of integrating technology in the primary teacher curriculum. A descriptive survey research design was used in the study which was conducted in four (4) public primary teacher training colleges in Central region of Kenya. These provided an ideal population for the study. The target populations were tutors, second year student teacher trainees, College principals and Kenya Institute of Curriculum Development (KICD) e-learning Officers. The major research instruments were questionnaires for tutors and student teacher trainees, interview schedule for the principals and Kenya Institute of Curriculum Development e-learning developers, and observation schedule. The obtained data were analyzed systematically using descriptive statistics and presented with the help of frequency tables, figures and percentages. The study findings revealed that the types of ICTs available were inadequate; access to the computers was poor with limited internet connectivity. There was lack of proper training in the use of ICTs and that preparedness in integration of ICT was at an infant stage. Adoption of integrating ICT by tutors into their instructional process was not significantly related to their years of teaching experience. Further, there was no significant relationship between the tutors’ attitude towards integrating ICT. Finally, tutors faced several challenges in an attempt to integrate ICTs into the curriculum such as inadequate facilities, lack of competence, knowledge and skills, lack of support from the college administration and the government and lack of ICT policies on integration of ICT in PTTCs. In view of these findings, key recommendations were made: PPTTCs have a revised syllabus to include ICT, KICD develop and supply e-content to PPTTCs and the ministry of education together with other stakeholders needs to come-up with clear guidelines on integration of ICTs in PTTCs.
EXPLORING ENABLING INTERVENTIONS FOR INCREASING FEMALE STUDENTS’ ACCESS AND PARTICIPATION IN SCIENCE, TECHNOLOGY, ENGINEERING AND MATHEMATICS (STEM) DISCIPLINES IN KENYAN PUBLIC UNIVERSITIES

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Globally, studies continue to document disparities in women’s access and participation in Science, Technology, Engineering and Mathematics (STEM) disciplines in the universities. In developing countries such as Kenya, such disparities are more structural and systematic. Despite existence of policies at the national and institutional level, no single and clear road mark exists on what set of interventions can best contribute to redressing this disparities. This study draws attention to the low participation of female students in STEM disciplines and especially in hard sciences in Kenyan public universities. Some studies, at the global level do indicate closing of the gender gap in some of the STEM disciplines, while in others, there is a regression leading to gendered dimensions even within the STEM disciplines. This study was conceptualized to explore interventions that are being implemented to enable access and participation of female students in Kenyan public universities. The study conceptualized participation to include: initial enrolment, persistence through a course of study, completion and graduation. Literature review for the study did reveal the persistence of socio-cultural and institutional barriers in limiting female students from participating in STEM disciplines. Three theoretical models; Social constructionist, the pipeline and the deficit model guided this study and illuminate how society persistently pushes women to partake stereotypically feminine STEM disciplines. The study utilized a descriptive survey design. Data for the study were collected in three public universities that were purposively sampled. Questionnaires, interviews, observations, content and documentary analysis were used as key instruments for data collection. Data were analyzed both quantitatively and qualitatively. The study findings revealed that, despite the existing educational gender interventions, female students’ enrolment and participation in STEM disciplines in the Kenyan public universities is 30% and less than 20% in hard sciences. The study also established that a continues process of gender typing of the school curriculum which the students pick from their high schools, and which continues to manifest in universities has created a false perception
among female students that soft science marketable for the female gender and are feminine compared to the hard sciences. Existence of socio-cultural and institutional barriers affects female students’ participation in STEM disciplines. The study established that the following interventions if implemented at the institutions would enhance female participation in STEM disciplines. First, the government and universities need to develop educational STEM policies and interventions to increase female participation in STEM disciplines. Second, the STEM curricula should be made gender responsive with integration of additional STEM female faculty members to act as mentors to female students. Appropriate STEM mentoring and career guidance should be enhanced at all levels of education and all educational stakeholders should be involved in minimising socio-cultural, institutional barriers and stereotypes on masculinity of STEM disciplines.

PARENTS’ PARTICIPATION IN THE BOY-CHILDS’ EDUCATION: A CASE OF CLASS THREE CHILDREN IN NYERI COUNTY, KENYA

MAINA ANNE WANJIRU – Ph.D

Department: Early Childhood Studies

Supervisors: Dr.Teresa Mwoma
Dr. Rachel W. Kamau Kang’ethe

Reviewed literature indicates that parents, as the first teachers of their children, influence performance in children’s education especially when fathers are positively involved. Parents are the significant others from whom children learn through observation, imitation and role modeling. Studies done in Kenya focused on parental responses in relation to education without considering that fathers’ and mothers’ roles are different and that their influence on children’s development differs. This study, therefore, sought to establish the role of individual parents in the boy-child’s education and the influence of such role in the boy-child’s academic performance in class three. Objectives of the study included: finding out the extent to which parents participate in the boy-child’s education and the effects of their participation on their academic performance, to investigate whether parents are aware of their roles and influence in the boy-child academic performance, to determine the factors that affect parent’s participation in the boy-child’s education activities and lastly to find out whether there was any significant relationship between the level of parental gender participation and academic performance of the boy-child. The study was guided by two theories: Grolnick’s (2002, 2009) theory of parental involvement and Epstein’s model for parental involvement in education (2002). The study might be of importance to educationists and policy makers. They can use the results to formulate
strategies of involving both parents in participating in boy’s education activities that influence academic performance. The study locale was Nyeri County. The study population included: the boy-child in class three their two parents and class three teachers. Stratified, purposive and simple random sampling techniques were used to select 220 boys, 440 parents and 16 class three teachers from 13 public primary schools. Validity of the research instruments was ensured through expert evaluation and judgment on content for validation, tools covered all the study variables and answering respondents’ questions to ensure internal validity. Coefficient of validity index was used to compute the ratings from experts in the department. Reliability was ensured using Cohan Kappa inter rater reliability testing. Questionnaires, interview schedules and document analysis were utilized to collect data. Qualitative data collected through interviews were categorized according to themes and discussed qualitatively. Statistical Package for Social Sciences (SPSS) was utilized to summarize and organize quantitative data for analysis. Quantitative data was analyzed using the Chi-square test and presented using frequency tables and charts which formed the basis for discussions. Chi-square test and odds ratio were used to establish the predictors in the boy-child academic performance. Descriptive research design was used for the study. Findings from the study revealed that parental participation but at a very low level to influence above average academic performance. Other findings revealed that fathers participated more in financial activities while mothers were active in all educational activities including financial activities. Though mothers were more active, Fathers’ influence was a major predictor in the boys’ academic performance. Three factors were cited as hindrances to effective parental participation in the boy-child’s performance in the area of study: income, occupation and lack of parents’ awareness of their roles in academic performance other than paying school fees. The study recommended that parents should be sensitized on their roles in education of the boy-child and be encouraged to assist their children in achieving high academic standards. The schools should also have policies that systematically involve parents in academic activities.

PREDICTORS AND OUTCOMES OF ACADEMIC SELF-CONCEPT AMONG NON-FORMAL PRIMARY SCHOOL PUPILS IN RUAARAKA DIVISION, NAIROBI COUNTY, KENYA

CHARITY C. NYAGA – Ph.D
The primary school pupils’ performance in national public exams is skewed towards the poorer mean scores. The lowly performance has been mainly ascribed to school ecological aspects and minimum research has been carried out on psychological influences which may account for pupils’ academic achievement. The purpose of the present investigation was therefore to explore some predictors and outcomes of academic self-concept among pupils in non-formal primary schools. Specifically, the selected predictors of academic self-concept were pupils’ perception of teachers’ expectations, academic buoyancy and pupils’ internal/external frames of reference. Academic achievement and academic engagement were studied as outcomes of academic self-concept. Further, gender differences in both academic self-concept and academic achievement were studied. Carl Rogers’ theory of personality development formed the theoretical framework. The study adopted an ex post-facto research design. The target population was all the 2014 class 8 pupils comprising of 2,706 pupils (1,272 boys and 1,434 girls) in non-formal primary schools in Kasarani District, Nairobi County and the accessible population was 1,715 class 8 pupils in Ruaraka Division. The sample consisted of 367 pupils” from 10 non-formal schools. Stratified, systematic and purposive procedures were used in the selection of schools and participants. Research instruments included pupils’ questionnaire, school records and academic self-concept ladders. Perception of Teachers Expectation Scale and Academic Buoyancy Scale were adapted to measure perception of teachers’ expectations and academic buoyancy respectively. Academic Self-Description Questionnaire II was adapted to measure pupils’ Internal/External frame of reference while School Engagement Scale and Students Engagement Instrument were adapted to measure pupils’ academic engagement. The questionnaire was piloted on 30 pupils from two schools. Pupils’ academic achievement was measured by use of examination records obtained from the schools. Both descriptive and inferential procedures were employed to analyze the data. The results provided indication that pupils’ perceptions of teachers’ expectations, academic buoyancy and internal/external frame of reference significantly predict academic self-concept. Further, academic achievement and academic engagement were significant outcomes of academic self-concept. However, the most critical predictor of academic self-concept was internal/external frame of reference and the most significant predictor of academic achievement was academic self-concept. Significant gender differences were found in academic self-concept and they were in favour of the male gender, but there were no significant gender differences in academic achievement. A key implication of the study was that teachers, parents and other stakeholders in education should collaborate in creating favourable school and home environments for nurturing the development of academic self-concept among pupils. The study recommends training of teachers in diversity of issues and sensitivity when handling pupils so that they remain optimistic, motivated and successful through development of positive academic self-concept.
CHANGES IN TRADITIONAL ISLAMIC HIGHER EDUCATION AT THE KENYAN COAST FROM 1850-1978

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This study traces the origins, growth and transformation of traditional Islamic higher education in the coastal region of Kenya from 1850 to 1978. The study was guided by the following objectives: to examine the arrival of Islam and its contribution to the emergence of traditional higher Islamic education in the coastal region in Kenya in the period 1850-1900; interrogate the social, economic, religious and political factors that led to the growth of non-formal and formal Islamic education in the coastal region from 1850-1978, examine institutions which offered traditional higher Islamic education in coastal towns, assess the curriculum of this education from 1850-1978, examine the impact of British colonial rule on the development of traditional higher Islamic education in coastal Kenya in the period 1900-1963 and demonstrate the impact of Independence on the growth of Islamic higher education in coastal towns of Kenya from 1963 to 1978. The study employed John Dewey’s egalitarian/problem solving theory, Emile Durkheim’s theory of moral and sociology of education, Al-Ghazali’s and Al-afendi’s theory of Islamic education. The study adopted a descriptive research design and used the historical method in the collection of data. Oral interviews, Archival material and library research were used in identifying, collecting and collation of data for this study. The data collected was analyzed qualitatively using historical techniques of narration, description, inference and logical explanation. The study findings were presented as a critical narrative of the rise, growth and decline of traditional higher Islamic education in coastal Kenya from 1850-1978. The study established that traditional higher Islamic education in Kenya emerged as a non-formal system of education conducted in mosques and informal lessons conducted in private houses of Islamic scholars who came to visit Lamu, Malindi, Mombasa, Zanzibar and the Comoro islands in the 19th century A.D. Traditional higher Islamic education was in three levels: basic education, primary education and higher education. In 20th century traditional Islamic higher education changed from non-formal to a formal education with a comprehensive
curriculum. This system of education was offered in specific institutions established in the towns of Lamu, Malindi, Mombasa and Zanzibar. The study also found out that the achievement of independence in Kenya led to establishment of secular education, which marginalized Islamic systems of basic, primary and traditional higher education. Muslims who wanted to access traditional higher Islamic education had to seek admission in Islamic universities in North Africa, Middle East and South Asia.

TEACHERS’ MOTIVATION AS DETERMINANT OF INCLUSIVE EDUCATION IN EARLY CHILDHOOD CENTERS, KAMPALA DISTRICT, UGANDA

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Studies from other countries with different social economic and political environments have identified teacher motivation as one of the factors that enhance Inclusive Education, while those specific to Uganda were yet to be determined. Whereas the Inclusive Education Act of 2011 was enacted in Uganda to ensure that all children benefit from education, teacher motivation still remained a challenge as many children remained left out. The purpose of the study was to establish teachers’ motivational factors that influence the implementation of inclusive education in ECD centres in Uganda. The study specifically explored strategies currently used in motivating teachers in the implementation of Inclusive Education in early childhood and examined; basing on Vroom’s (1964) Valency Instrumental Expectancy theory how teachers’ attitudes, competency and satisfaction influence implementation of Inclusive Education. The study employed a descriptive survey research design, with qualitative and quantitative approaches. A non-random sample of MOEs officials, head teachers, inspectors of schools and teachers plus a random sample 355 teachers of lower primary and pre-primary classes participated in the study. Respondents were selected from the five divisions of Kampala Capital city in Uganda namely: Central, Kawempe, Makindye, Nakawa and Rubaga. A structured questionnaire (α=.824, CVI=. 0.86) interview schedules (CVI=.81, CVI=.75) and focus group discussion guide (CVI=.80) were used to collect data. Frequency tables and content analysis
were used to present and analyse the findings. Findings revealed that low salaries, lack of professional development and poor conditions of service led to low job satisfaction and neutral attitudes that prevented teachers from using the skills they had to implement inclusive education in ECD centres. It was concluded that stakeholders in education should seriously address de-motivating factors to empower teachers implement inclusive education more effectively. A large scale study is required to identify other possible factors that can motivate teachers in inclusive settings. It is recommended by this study that different teacher support programmes should be established to ensure that children are fully supported in inclusive education.

LEVELS OF TEACHER SELF-EFFICACY AND USE OF MUSIC ACTIVITIES IN PRE-SCHOOLS IN NAIROBI AND KIAMBU COUNTIES, KENYA.

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Prof. John Aluko Orodho

Despite the fact that pre-school teachers undertake specialized courses to enable them to use music activities in the course of teaching, there is a lot of variability in the frequency, variety and purposes to which these activities are employed. The purpose of this study was to examine the levels of teacher self efficacy and use of music activities in pre-schools in Nairobi and Kiambu Counties. The study is grounded on the self efficacy theory by Bandura and complemented by the theory of multiple intelligences by Gardner. The self efficacy theory focuses on teacher self beliefs which are important in shaping classroom behavior, while the theory of multiple intelligences proposes several distinct types of intelligences which include musical intelligence. The study adopted a sequential mixed methods design for data collection. It endeavored to examine the levels of TSE among pre-school teachers and compare the frequency, variety and reasons for use music activities in pre-schools in Nairobi and Kiambu counties across the levels. The target population was 8211 pre-school teachers in Nairobi and Kiambu counties. The sampling frame was the 2740 pre-schools in Nairobi and Kiambu counties which were clustered into sub counties, and stratified random sampling was used to get ten sub counties. From each sub county, twenty pre-schools were randomly sampled with proportionate allocation from both public and private pre-schools. From each pre-school, one teacher was randomly sampled for inclusion in the study. One hundred and ninety-four pre-school teachers filled a modified Ohio State Teacher Efficacy Scale questionnaire which had been piloted on three pre-school teachers not used in the study. The data was analyzed using descriptive statistics and then ranked. Two
groups of respondents were identified based on the ranking: the top 25% and the bottom 25% deemed as those with high TSE and those with low TSE respectively. Purposive sampling was used to get thirteen teachers for each of the two groups, who were observed and audio recorded while teaching and later interviewed. The findings indicate that pre-school teachers in Nairobi and Kiambu counties have high self-efficacy levels and all employ music activities in varying degrees in their classrooms. Using Students’ tests, the study determined that the difference in the frequency of use of music activities between pre-school teachers with different levels of TSE was statistically significant while the difference in the variety of music activities was not statistically significant at 0.05 significance level. The study unearthed creative and innovative ways of using music activities in class which were reported qualitatively. There was a lot of similarity in the way teachers with different levels of TSE used music activities. The reasons for use of music activities were also similar for teachers across both categories of TSE. The study recommended more use of music activities in the course of teaching. It is envisaged that the findings from this study will prove useful in adding variety to the uses of music activities in preschools and may provide additional strategies for instruction at this and other levels of learning. The findings may inform policy at National Centre for Early Childhood Education in order to increase the levels of Teacher Self-Efficacy for the granduands.

INFLUENCE OF LEARNER SUPPORT ON INTERNAL EFFICIENCY OF DISTANCE TRAINING PROGRAMME FOR IN-SERVICE SECONDARY SCHOOL TEACHERS, RWANDA

NDAYAMBAJE IRENEE – Ph.D

Department: Educational Management, Policy and Curriculum Studies
Supervisors: Dr Norbert Ogeta
Prof. John Aluko Orodho

In distance education, learner support is key to upholding internal efficiency. Despite the Rwandan Government investments, internal efficiency remains problematic in Distance Training Programme (DTP). The purpose of this study was to determine the influence of learner support on internal efficiency of DTP for in-service secondary school teachers in Rwanda. Research objectives were to: (i) Find out the influence of instructional resources on internal efficiency of DTP for in-service secondary school teachers in Rwanda, (ii) Determine the influence of human
support on internal efficiency of DTP for in-service secondary school teachers in Rwanda, (iii) Establish the effect of system support on internal efficiency of DTP for in-service secondary school teachers in Rwanda, and (iv) Explore the factors that affect learner support provision and their implications on internal efficiency of DTP for in-service secondary school teachers in Rwanda. This study was informed by the Educational Production Function Theory propounded by Eric Alan Hanushek. The study adopted the Explanatory Sequential Mixed Methods Design. From a target population of 1346, purposive and stratified random sampling techniques enabled to reach a sample of 315 subjects including students and staff. Learner support questionnaires, observation check list, interview guide and document analysis constituted instruments for this study. Content validity was established by experts’ appraisal. Cronbach’s Alpha reliability tests produced 0.856 and 0.924 respectively for learner support questionnaire for staff and DTP students. Quantitative data were analyzed and presented in form of tables. Analysis was based on Descriptive Statistics (Mean Scores) and Regression Outputs (Beta and P-values). Qualitative data analysis used Thematic Analysis, Tally Method and Quick Impressive Summary and reporting in narrative form. This study found out that (i) there is a statistically significant influence of instructional resources on dropout rate of DTP ($p=0.016<0.05$). Indeed, delay and irregular revision of DTP modules coupled with the shortage of auxiliary learning resources obstruct internal efficiency of DTP. (ii) The influence of human support on internal efficiency of DTP was not statistically significant. Nonetheless, the pinpointed vacancies of DTP tutors, poor supervision of weekend tutorials’ activities, delay of DTP tutors’ payment and shortage of staff in Study Centres hinder internal efficiency of DTP. (iii) The effect of system support on internal efficiency of DTP was not statistically significant. However, abrupt changes in the schedules of activities, delays of feedback, tiring procedures, poor technology and the limited assistance of Study Centres to students hamper internal efficiency of DTP. (iv) The identified constraints to learner support which hold negative implications on internal efficiency of DTP include limited funding, poor staff motivation and training, as well as poor managerial competence and enthusiasm. As conclusion, though learner support did not bear statistical significant influence on internal efficiency ($p=0.357$, $p=0.557$, $p=0.139 > 0.05$), the Pearson’s $r$ has shown that the two variables have moderate positive levels of association ($r = 0.495$, $r =0.407$, $r = 0.617$). In addition, the R-square ($R^2$) informed that 24.5%, 16.6% and 38.1% of respective changes in promotion, repetition and dropout rates of DTP were explained by learner support. Therefore, the present study recommended the increase of funding, the adequate staffing, autonomy and enforced managerial strategies in DTP so as to safeguard its internal efficiency. The findings have also shown the way to two research areas for further studies.

**PREDICTORS OF ACADEMIC DISIDENTIFICATION AMONG FORM THREE SECONDARY SCHOOL STUDENTS IN MOMBASA COUNTY, KENYA**

**OTANGA HABIL FERD – Ph.D**

Department: Educational Psychology
Supervisors: Dr. Sammy T. Tumuti  
Dr. Jotham M. Dinga

The study investigated the extent to which gender, type of school, academic achievement and causal attributions predict academic disidentification of secondary school students. The extent to which academic self-esteem mediated the relationships with two specific aspects of disidentification, discounting and devaluing was also studied. The study employed correlational and exploratory designs. Martin Covington's Self-worth Motivation Theory and Carl Rogers' Self Theory of Personality Development anchored the study. Failure and inappropriate attributions were hypothesised to reduce students' academic self-esteem and result in self-worth protection through discounting feedback and devaluing academic achievement. The study was conducted in Mvita sub-county, Mombasa County, Kenya. Purposive, stratified and simple random sampling was used to select a sample of 449 students (206 male and 243 female) and 11 teachers from 12 schools. Research instruments included document analysis, a students’ questionnaire and semi-structured interviews. For the students' questionnaire, the State Self-esteem Scale, Multidimensional-Multiattributinal Causality Scale and the Intellectual Engagement Inventory were adapted to measure academic self-esteem, causal attributions and academic disidentification respectively. Teacher interviews were done in the respective schools. Statistical Package for Social Sciences (SPSS) was used to analyze quantitative data. Qualitative data was analyzed using thematic analysis. All the hypotheses were tested at $p < .05$ level of significance using regression analysis and ANOVA. Findings show that female students reported higher discounting while male students reported higher devaluing. There was a significant interaction effect of gender and type of school on academic self-esteem and discounting. Academic self-esteem was positively related to academic achievement and negatively related to both discounting and devaluing. Academic achievement negatively predicted both discounting and devaluing and significantly predicted devaluing and not discounting. Stable attributions significantly positively predicted discounting. Stable and unstable attributions significantly positively and negatively predicted devaluing respectively. Internal attributions to success and external attributions to failure negatively and positively predicted discounting respectively. Internal attributions for success and external attributions for failure negatively and positively predicted devaluing respectively. Academic self-esteem partially mediated the relationship between academic achievement and devaluing. Academic self-esteem partially mediated the relationship between attributions and both discounting and devaluing. Overall, the findings of the study supported the guiding theory of the study - the Self-worth Motivation Theory. Based on the findings, it was recommended that schools institute mentoring programs and educational guidance and curriculum developers strike a balance between norm-referenced and criterion-referenced evaluation.
GERALDINE KALEKYE MUSYOKI – Ph.D

Department: Gender & Development Studies

Supervisors: Prof. Elishiba Kimani
Dr. Casper O. Masiga

This study sought to explore the effects of obstetric fistula on womanhood and demonstrate how these effects shape the identities of afflicted women in West Pokot County, Kenya. The specific objectives of this study were: to explore the social construction of womanhood among the Pokot; identify perceived factors contributing to the development of obstetric fistula among women; determine the effects of obstetric fistula on womanhood in the County and assess the coping strategies adopted by afflicted women to cope or live with obstetric fistula. The study was guided by Judith Butler’s Performativity Acts and Gender Constitution Theory. The theory was complemented by Lazarus and Folkman’s Transactional model of stress and coping, which emphasizes appraisal to evaluate harm, threat and challenges. The study used the phenomenological design to both quantitative and qualitative research. Purposive sampling was used to identify the study-site, key-informants and women with repaired obstetric fistula. Snowball sampling identified women with unrepaired obstetric fistula while convenience sampling was used to sample their spouses/care-givers. Guided questionnaires, interview schedules and observation check-list were used to generate data. Quantitative data were analyzed using descriptive statistics and presented in tables and graphics as percentages and frequencies. Qualitative data were collected through narratives during interviews and analyzed and presented thematically. Findings from this study revealed that 88% of the affected women had never heard of the condition before diagnosis at a health facility. Misconceptions about the real causes of obstetric fistula were linked to cultural taboos and superstitious beliefs. Only 18% of the respondents could associate the condition with the immediate events of childbirth, while 53% thought it was incurable. The affected women at 77% had a high preference for non-skilled birth attendants during delivery away from health facilities, a factor that predisposed them to obstetric fistula. The women, their spouses/care-givers, elders and medical health providers represented at 95% affirmed that obstetric fistula affected women in various ways. The affected women experienced a deep sense of loss that has a negative impact on their identity and quality of life. These losses were signified as failures of motherhood, reproduction, sexuality, identity and marriage. To cope with obstetric fistula, the women used among others, home-made padding, frequent bathing, self-isolation, and limited food and water intake. The study recommends an intensive awareness on factors that predispose women to the occurrence and management of obstetric fistula and the potentially positive reproductive prospects after treatment. Prevention strategies must be community inclusive and participatory so as to build locally appropriate and acceptable solutions. Any efforts to reduce maternal mortality and morbidity, must focus on having a sound knowledge of the risk factors that predispose girls and women in Kenya to developing obstetric fistula; mass awareness and mobilization of the community on the
The quality of curriculum and curriculum support materials used by the teachers and learners affects the quality of education that is delivered during an instructional process. For many years, educational materials have mostly been static text with pictures printed in books. These kinds of materials do not have strong potential to provide appropriate learning environment for learners who are technologically savvy and who expect interactive engaging learning experiences. In recent years, there has been rapid expansion in digital content development and access in schools. There have been many initiatives geared towards development and provision of digital content to schools in Kenya. However, little has been done to ensure that learners and teachers actually utilize the digital content in the instructional process. This study therefore investigated the influence of utilisation and design of curriculum digital content on Biology instructional process among secondary schools in Nairobi county, Kenya. It also sought to provide a model for development of effective digital content for Biology instruction. It was guided by five specific objectives. These include to: establish secondary school learners’ and teachers’ utilisation of curriculum digital content in the Biology instructional process, determine whether utilisation of secondary school curriculum digital content influences the Biology instructional process, analyse the nature, and influence of curriculum digital content multimedia elements on the secondary school Biology instructional process, examine the formulation, and influence of curriculum digital content user interface on the secondary school Biology instructional process and derive a model that can guide the design and development of an effective digital content for secondary school Biology curriculum. A mixed methods design was used for the study which involved fifteen ESP-ICT phase 1 secondary schools and two digital content development institutions in Nairobi county. Six instruments were used for data collection which include; Biology teacher questionnaire, learners’ focus group discussion guide, Biology teaching and learning resources inventory, digital content analysis sheet, documents analysis sheet and digital content developers’ interview schedule. The collected data was analysed using both descriptive and inferential statistics and presented in form of notes,
numerals, tables, and graphics. This study found out that utilisation of curriculum digital content influenced assessment and achievement of learners in Biology positively. However, the study found no significant difference in syllabus coverage between the groups that utilised Biology digital content and the ones that did not. There were also issues in Biology digital content access, multimedia elements and user interface which affected content utilisation and consequently its influence on the instruction process. Packaging and dissemination of digital content in both online and offline formats was recommended to improve the level of access and utilisation of digital content. To address the design issues of the content, the study recommended that developers do proper needs analysis, proper combination of multimedia elements and design appropriate user interfaces. The study also derived a model that can guide and improve the process of developing more effective curriculum digital content.
This study set to investigate the participation motives and competitive orientations of women football players in the Kenyan premier league. The major objectives of the study were to examine what motivates them to participate in football, what goals they seek to achieve in playing football and how selected demographic factors of age, educational level and years of experience influence their participation motives and competitive orientation. The study also examined the relationship between participation motives and competitive orientations in sports. Data was collected using the instruments; Participation Motivation Questionnaire (PMQ) to assess their motives for participation and the Task and Ego Orientation in Sport Questionnaire (TEOSQ) to assess their competitive orientations. Out of a target population of 360 players in the league, simple random sampling procedure was used to select women football players N=192 from the 12 clubs to participate in the survey. Data was coded using SPSS version 20. Shapiro-Wilk's and Levenes’ tests were used to test normality of data and Homogeneity of Variances respectively. KMO and Bartlett’s tests were used to assess whether it is appropriate to run a principal component analysis. A principal component analysis was performed on the PMQ and TEOSQ items. One way ANOVA was used to determine whether competitive orientations and participation motivation of players differ based on age, playing experience and educational level.
Tukey Post hoc test was used to test any significant differences after significant F-ratios. Pearson-product moment correlation coefficient was conducted to examine relationships among competitive orientations and participation motivation of the players. All hypotheses were tested at 0.05 significance level. Results revealed that the top participation motives ranked in order were: skill/team; fitness/win; friendship/affiliation; status/achievement and energy release. For competitive orientations, result revealed that players were more task oriented than ego-oriented. There were significant differences in participation motives based on playing experience and educational level; however, there were no age-based differences among women the players’ participation. On competitive orientation, the study found no significant differences in age and playing experience, however, there was a significant difference in educational level. Pearson product moment correlation analysis showed a relationship between task orientation and intrinsic sources of motivation (skill development/team), whereas ego orientation was found to relate well with more extrinsic forms of motivation (status/recognition). Overall, results of this study indicate that women football players in the Kenyan premier league value intrinsic motivation and stand out for being more task-oriented than ego oriented.

DETERMINANTS OF WOMEN’S PARTICIPATION IN RECREATIONAL ACTIVITIES IN KIBERA INFORMAL SETTLEMENT, NAIROBI COUNTY, KENYA
MUREITHI PURITY KAGWIRIA – M.Sc

Department: Recreation Management and Exercise Science

Supervisors: Dr. Andaje Mwisukha

Prof. Vincent Onywera
Both leisure and recreation are crucial components of a balanced and healthy lifestyle. This study assessed the determinants of recreation participation for women in Kibera Informal Settlement. The study adopted the descriptive survey research design to obtain information that describes the existing phenomena about available recreation opportunities and the factors that determine the frequency and level of participation. The study was carried out in Kibera Informal Settlement, Lang’ata Sub-County, Nairobi County where a sample size of 384 female respondents was selected using random sampling technique. Self-administered structured questionnaire with closed-ended questions were administered to sampled women residing in Kibera informal settlement. Data were processed using the Statistical Package for Social Sciences (SPSS) version 20 and the results were organized, tabulated and presented in frequencies and percentages. Chi-square ($\chi^2$) test of independence at a significance level of 0.05 was used to test the null hypotheses. The study showed that most families had family sizes of 1 to 2 children, 223 (58.07%) of the respondents had attained only primary education, 165(43.0%) of the respondents were not employed, 183(47.66%) reported as self-employed earning less than Ksh.10,000 per month. The most popular indoor and outdoor activities were listening to music and walking respectively. Majority of the respondents reported availability of time and age as determinants of frequency of participation in both indoor and outdoor recreational activities while education level was reported as determinant of frequency of participation in indoor recreational activities. User charges, family size, income level, awareness, distance and transport to recreation opportunities do not determine frequency of participation in both indoor and outdoor recreational activities. Education level was not a determinant of frequency of participation in the outdoor recreational activities. The study recommends that the county government should set aside land for developing various recreational facilities within the informal settlement areas to be accessed by all residents to mitigate time constraints, for example, construction of swimming pools since swimming is reported as the least popular outdoor activity, the ministries of Health and Sports, Culture and the Arts to educate the members of the public within the informal settlement on the health benefits of recreation and good time management so as to encourage more people including those with higher levels of education to take part in various recreation activities since level of education emerged as one of the demographic factors influencing frequency of participation in indoor recreational activities, the city planning department to give greater emphasis on creation of streetscapes within and outside the informal settlement areas that enhances walking for recreation, Recreation service providers to avail affordable and pleasanter recreational facilities and programme catering for all ages since age arose as one of the demographic factors influencing frequency of participation in recreational activities among women in Kibera informal settlement.
In Kenya, tourism has been recognized as one of the key drivers of economic growth and poverty reduction. This is because tourism has a great multiplier effect that is able to catalyze growth in all sectors of the economy. The sector has been performing well and it was anticipated that international arrivals would reach the 2 million mark by the end of 2012. However, there was a decrease by 0.3% from 1.785 million in 2011 to 1.780 million in 2012 and 1.5 million in 2013. The decline could be attributed to the euro zone crisis coupled with perceived insecurity in the country. Kenya is ranked 135 out of 140 countries globally by the Travel and Tourism Competitive Index on safety and security concerns. Therefore, the purpose of this study was to examine the effects of insecurity on performance of the hotels. The study was guided by the following specific objectives: to determine the indicators of vulnerability of the hotel facilities towards insecurity; to find out the current hotel standards of security within the hotel facilities; to evaluate the effects of insecurity on the hotels’ performance; to profile crime trends and security
threats in the hotel industry. The study employed both quantitative and qualitative methods of data collection. The study used questionnaires and interviews to collect data. The study adopted a cross-sectional analysis using a sample of 160 respondents. Nairobi hotels were less vulnerable than hotels in Mombasa. This implied that investors have more confidence in Nairobi than Mombasa due to favorable conditions such as safety and security of guests; The age of the hotel did not affect security levels of the establishments; security is a multiplicity of factors interaction and not a single consideration; The quality, security, age and occupancy rate of hotel are potential factors affecting the costs for operating and maintaining the hotel. There was significant difference in training across the two regions with Mombasa doing it more frequent compared to Nairobi (p value<0.001). There was a gap between the training and the application of the security procedures. On the cost of security expenditure, Nairobi had invested more than Mombasa. The increase of security costs has led to increase of recovery rates. Nairobi and Mombasa regions had a positive correlation between occupancy and security investment. As the hotel invested more in security devices, there was an increase in the occupancy rate. However, this was not statistically significant, as there was an inverse correlation in some of the hotels for the two regions. For instance, higher stars (4 & 5) had a negative relationship of -0.87 and 0.05 respectively. The higher the occupancy rate the lower the investment of security in the hotel industry; none of the factors significantly explained the security investment among the hotels (p value > 0.05). The three factors (occupancy, star rating and region) explained only 17% of the total security investment in the hotels, leaving 83% of the investment unaccounted for. This indicates that investment in security among the hotels is explained by factors other than occupancy, star rating or region. The study recommends that hotel staff needs to have specialized training on security matters at higher levels to be able to respond to different threats in hotel industry. Training should commensurate to the needs of the hotel industry. There is need to capacitate the security guards, so that they will be able to expand their scope of security within the hotel industry. There is also need to continually develop security strategies to meet the evolution of security challenges in the hotel industry. At the same time there should be uniform platform of security procedures in the hotel industry to be consistent with internationally security standards.
FOOD SAFETY AND HYGIENE PRACTICES: A COMPARATIVE STUDY OF SELECTED TECHNICAL AND VOCATIONAL EDUCATION AND TRAINING AND UNIVERSITY HOSPITALITY SCHOOLS IN KENYA

MONICA A. WANDOLO – Ph.d

Department: Hospitality

Supervisors: Prof. Douglas Ndiritu
Dr. Rosemarie Khayiya

Food is a basic human need that plays a vital role in the sustenance of life. Its safety, however, has become a major concern to the food industry given that the consumption of contaminated food and water contributes to a myriad of health problems the world over. Although food prepared and served at the restaurants may look clean and taste delicious, it may have been contaminated by biological, chemical or physical hazards during the preparation procedures from the source through to service. Food workshops (kitchens) are viewed as the major sources of contaminations from poor sourcing and handling practices which include undercooking, poor personal hygiene, and use of unclean equipment, inappropriate storage and incorrect holding temperatures. Despite extensive investment in training of food handling personnel, food-borne diseases remain a contentious problem to both developed and developing nations. The general objective of this study was to compare food safety and hygiene practices in training colleges to ascertain their capacity in training food safety and hygiene practices. The specific objectives included to compare the level of hygiene awareness in Technical Industrial Vocational and Entrepreneurship Training (TVET) and University hospitality Schools, to compare food-handling practices between TVET and University hospitality schools, to establish their capacity in offering food safety and hygiene practices, to assess the applicability of HACCP pre-requisites, to determine barriers to food safety and hygiene practices in these institutions and more importantly, to determine the microbial load of vegetables served from these institutions. Hospitality training encompasses appropriate food handling procedures, careful selection of food source and use of correct equipment, proper storage, proper cleaning procedures and proper management of food waste. All University hospitality schools and food and beverage departments in TVET colleges were considered as reliable sources of information. Accordingly, the target population included both students and heads of these departments. The instruments used to collect data included questionnaires, interviews, observation checklists, photographs and
focus group discussions. An observation checklist was used to assess good hygiene practices (GHP) particularly in the training workshops. Both descriptive and inferential procedures were used in data analysis and hypotheses. Chi-square was also used to test the independence of various samples. Both paired t-test and one sample t-tests were used to test for equality of various study variables in the two institution categories. All tests were performed at 95% confidence level. For microbial tests, Samples of spinach, coleslaw and macèdione of vegetables (n=36) from these institutions were analysed in the laboratory to determine the microbial load, 

*aerobic plate* count and *coli*form. Finally, to determine the barriers to food safety, a multiple regression analysis was undertaken. The study established that the levels of awareness varied across the institutions. Out of the total number of students, 17% were not aware of HACCP principles. Institutions had no safety guidelines therefore no operational standards were followed. The study revealed that institutions were not adequately equipped, and the HACCP prerequisites were not used in most of the institutions. Multiple regression analysis revealed that lack of resources posed a serious threat to food safety and hygienic practices. The isolation of *E.coli*, *salmonella and pseudomonas* confirmed that food safety in the institutions was compromised. This study therefore recommended that HACCP food safety system be introduced in all hospitality training institutions as a measure against food contamination.

**PHYSICAL AND PSYCHO-SOCIAL BENEFITS OF PARENTAL INVOLVEMENT IN ORGANIZED PHYSICAL ACTIVITIES FOR CHILDREN WITH INTELLECTUAL DISABILITIES IN NAIROBI COUNTY, KENYA**

MWANGI JANE WAIRIMU Ph.D.

**Department: Recreation Management and Exercise Science**

**Supervisors: Dr. Andanje Mwisukha**

**Dr. Peter Bukhala**

Physical activity (PA) is critical in motor skills development among children with intellectual disability (ID) but inadequate knowledge on the gains of parental involvement (PI) underscores the process. The purpose of the study was to establish the physical and psycho-social benefits of involving parents in an organized PA programme for children with ID of age 4-6 years. Quasi experimental non–equivalent control group research design was adopted for the study. The study targeted children with ID in inclusive Early Childhood Development (ECD) centres and their parents. However, two inclusive ECD centres in Nairobi County that had the highest number of leaners with ID were purposively selected and then randomly assigned into either experimental or control groups. 37 children with ID and their parents met the inclusion and exclusion criteria making a sample size of 74(80.4 %) out of the 92 total targeted population. A total of 64(86.4%) participants successfully completed the three-month PA programme. Test-retest was conducted
to determine reliability of research instrument. Parents’ responses were collected using a self-administered questionnaire while an adapted Test of Gross Motor Development (TMGD2) was used to record the observed motor performance of the children and an attendance checklist used to record frequency of attendance. Data was coded and organized using the Statistical Package for Social Sciences (SPSS) version 20. Results showed that most of the parents involved were female (71.1%) in control group and (100%) female in the experimental group while most children participants were male (85.7%). Independent t-tests showed significant difference after intervention in parents rating of their children’s motor performance in control group t(13)= -3.37, p<0.001; experimental group t(17)= -7.402, p<0.001 and parents’ self-rating t(13)=3.37, p=0.005 and t(17)= -10.84, p=<0.001. Parents gender had significant influence on children motor skills in the control group t (12) = -1.337, p=0.029. Pearson’s correlation(r) showed strong correlation between frequency of attendance to organized PA with mothers’ occupation r (32) = -.713, p<0.001 and education level r (32) = -.700, p<0.001 while fathers had moderate positive correlation in both occupation r (32) =.384, p=0.030 and education r (32) =.421, p=0.016. It was concluded that PI in organized PA greatly improved both children’s motor skill performance and parents’ psycho-social well-being. The change was more in the experimental group where children with ID and parents participated in the PA jointly. Initiating PA programmes for children with ID early enough, training parents and encouraging more parental involvement is recommended. The study recommends further research to examine levels of awareness of psycho-social gains of PI and variables that determine involvement of male guardians in children’s PA.

SCHOOL OF PUBLIC HEALTH

Masters
Global neonatal mortality stands at 22 per 1000 live births and about 41% of deaths in children under 5 years old occur in the neonatal period. In Kenya, neonatal mortality was 22 deaths per 1000 live births between the years 2004 and 2008 and 60% of infant deaths in Kenya occur during the first month of life. Neonatal sepsis is the leading cause (15%) of all neonatal deaths worldwide. Umbilical infections are an important cause of neonatal morbidity and mortality in developing countries with incidence rates as high as 55-197 per 1000 live births in community-based studies. Poor cord care practices may predispose to poor cord outcomes. The findings of this study will be used to make relevant recommendations on cord care and will probably trigger other researchers to study the subject of cord care and eventually influence cord care policies, guidelines and practices targeting reduction in morbidity and mortality related to umbilical cord infections and other umbilical cord conditions (prolonged cord separation and umbilical granulomas). The broad objective of the study was to determine the relationship between cord care practices and cord outcomes among neonates attending Meru Teaching and Referral Hospital, Meru County, Kenya. The study population was 132 mothers/caregivers and baby pairs of neonates. A case control design was used to compare cord care factors (sterility of cord cutting tools, application of substances on the umbilicus, hand washing before substance application, method of bathing, skilled birth attendance and source of advice on cord care) and cord outcomes. A focused group discussion and three key informant interviews provided secondary data. Cases were neonates presenting with omphalitis, tetanus, prolonged cord separation and umbilical granuloma while controls were neonates without the aforementioned conditions. A sample of 132 neonates (66 cases and 66 controls) was recruited. Data was collected using interviewer administered questionnaires, Key Informant Interview guides and a Focus Group Discussion guide. Data was analyzed using SPSS 20.0. Logistic regression was used to predict the probability of the outcomes of interest relative to the independent variables. P values and confidence intervals were used as inferential statistics. Thematic content analysis was
used in analysis of qualitative data. P value of <0.05 was considered significant. Dry cord care was associated with omphalitis (p=0.000, OR 15) but was protective for prolonged cord separation (p=0.015, OR 0.18). Home delivery, unskilled birth attendance and receiving advice on cord care from a non-health care worker were associated with neonatal omphalitis (p=0.001 for the three variables, OR 8.1 for home delivery and unskilled birth attendance and OR 7 for advice from a non-health care worker) and prolonged cord separation (p=0.000 for both variables, OR 13.6 and 10.8 respectively). Immersion bathing was associated with omphalitis (p=0.001, OR 5.7). From the FGD, it was reported that following most home deliveries, non-sterile cord cutting tools were often used and hand washing was not practiced before substance application to the umbilical cord. In conclusion, findings of the study indicate that dry cord care was significantly associated with neonatal omphalitis and use of antiseptics was significantly associated with delayed cord separation. Recommendations made include promotion of use of antiseptics for cord care and nationwide dissemination of current Ministry of Health Kenya guidelines on cord care to health care workers in order to harmonize cord care practice.

TO DETERMINE HYGIENE AND MICROBIAL CONTAMINATION OF MINIMALLY PROCESSED FRUITS AS STREET FOODS IN CENTRAL WARD, NAIROBI COUNTY

NDIEGE MERCY ADHIAMBO – M.P.H

Department: Community Health

Supervisors: Dr. Jackim Nyamari
              Prof. Jasper.K.Imungi

Despite numerous benefits of minimally processed fruits vended as street foods, it has been recognized that they can be a source of foodborne illnesses that can majorly result from poor hygiene practices and unsanitary conditions at fruit vending points. The main objective of the study was to assess the hygiene status and microbial contamination in fruit vending businesses in Nairobi central ward. The study was cross sectional with analytical component and through purposive sampling, 223 willing street food vendors from 7 clusters in the Central ward were selected for the study. Fifty two fruit samples of four fruit categories sold by different vendors in each cluster were pooled and homogenized, and a serving of each fruit typed weighed and analyzed in duplicate in the laboratory. The data collection tools utilized included a structured questionnaire and an observation checklist which were prepared using codex food hygiene and safety principles. Data collected was analyzed using SPSS version 21, Genstat 13th edition and Excel spreadsheet. Chi-square, and Kruskal Wallis tests were used to establish relationship...
between dependent and independent variables. All the significant tests for the hypothesis were at 95% confidence level (p< 0.05). Food hygiene knowledge and hygiene practice levels were ranked according to Bloom cut off points on calculated scores, where scores were converted to 100%. Based on the sum scores, Food hygiene knowledge and practice was classified as good (>80%); average (60-80%) and poor (0-59%). Food hygiene knowledge and practices were significantly different in the clusters (p>0.05) with vendors in City market and CBD having the highest Food Hygiene Knowledge score while vendors in Uhuru Park and OTC having the highest Food Hygiene Practice score. Hygiene status was not significantly associated (p>0.05) with either food hygiene knowledge or practice. Time period of experience was found to be significantly associated with hygiene status (p>0.05). The major sanitary deficiencies that were identified included no drying racks for cleaned utensils, (55%) lack of uniforms, (54%) vendors wearing jewelry (74%) while working, lack of training, (83%) lack of medical certificates (73%) and cracks and crevices on work surfaces (87%), presence of garbage and waste near stalls, (68%) uncovered dustbins, (95%) and presence of houseflies (25%). Expressed in log10 colony forming units/gram, high bacterial load counts, highest mean (log10 5.32cfu/g) were seen in fruit salad samples. High coliform load counts mean (log10 0.08) were seen in all the fruit samples indicating contamination with fecal matter, while high mold and yeast counts were found in fruit salad and pineapple samples. The null hypothesis was accepted. Compared to other similar studies, low levels of hygiene knowledge and practice were reported. The government should formulate a policy on ready-to-eat food vending as part of street food policy.

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Prof. Jasper.K. Imungi

Despite numerous benefits of minimally processed fruits vended as street foods, it has been recognized that they can be a source of foodborne illnesses that can majorly result from poor hygiene practices and unsanitary conditions at fruit vending points. The main objective of the study was to assess the hygiene status and microbial contamination in fruit vending businesses in Nairobi central ward. The study was cross sectional with analytical component and through purposive
sampling, 223 willing street food vendors from 7 clusters in the Central ward were selected for the study. Fifty two fruit samples of four fruit categories sold by different vendors in each cluster were pooled and homogenized, and a serving of each fruit typed weighed and analyzed in duplicate in the laboratory. The data collection tools utilized included a structured questionnaire and an observation checklist which were prepared using codex food hygiene and safety principles. Data collected was analyzed using SPSS version 21, Genstat 13th edition and Excel spreadsheet. Chi-square, and Kruskal Wallis tests were used to establish relationship between dependent and independent variables. All the significant tests for the hypothesis were at 95% confidence level (p<0.05). Food hygiene knowledge and hygiene practice levels were ranked according to Bloom cut off points on calculated scores, where scores were converted to 100%. Based on the sum scores, Food hygiene knowledge and practice was classified as good (>80%); average (60-80%) and poor (0-59%). Food hygiene knowledge and practices were significantly different in the clusters (p>0.05) with vendors in City market and CBD having the highest Food Hygiene Knowledge score while vendors in Uhuru Park and OTC having the highest Food Hygiene Practice score. Hygiene status was not significantly associated (p>0.05) with either food hygiene knowledge or practice. Time period of experience was found to be significantly associated with hygiene status (p>0.05). The major sanitary deficiencies that were identified included no drying racks for cleaned utensils, (55%) lack of uniforms, (54%) vendors wearing jewelry (74%) while working, lack of training, (83%) lack of medical certificates (73%) and cracks and crevices on work surfaces (87%), presence of garbage and waste near stalls, (68%) uncovered dustbins, (95%) and presence of houseflies (25%). Expressed in log_{10} colony forming units/gram, high bacterial load counts, highest mean (log_{10} 5.32 cfu/g) were seen in fruit salad samples. High coliform load counts mean (log_{10} 0.08) were seen in all the fruit samples indicating contamination with fecal matter, while high mold and yeast counts were found in fruit salad and pineapple samples. The null hypothesis was accepted. Compared to other similar studies, low levels of hygiene knowledge and practice were reported. The government should formulate a policy on ready-to-eat food vending as part of street food policy.
Cancer is among the leading causes of morbidity and mortality worldwide with approximately fourteen million new cases and eight million cancer related deaths annually with an approximated 60 per cent of these new cases and 70 percent of these deaths occurring in Africa and other developing countries. Cervical cancer in particular has contributed a fair share of this burden. In Kenya, cervical cancer incidence and prevalence is second to breast cancer and leading cause of cancer related deaths among Kenyan women with most cases being diagnosed when it is too late for any interventions. The solution lies in early screening of women, with visual cervical cancer screening approach being the most feasible for low resource settings in developing countries. Kenya, in recognition of this piloted and adopted this screening approach in the year 2002 in efforts to integrate the screening approach in all the reproductive health clinics through formation of national cervical cancer prevention strategic plan with an aim of raising screening coverage to over 70 percent. Despite this effort, the population of women screened remains alarmingly low with an estimated screening prevalence of only 3.2 per cent nationally. This cross-sectional study sought to identify challenges to visual cervical cancer screening service integration and utilization in Imenti South Sub-County, Kenya with the specific objectives of determining the proportion of respondents utilizing visual cervical cancer screening service, how respondents socio-demographic and reproductive health factors, facility based and system based factors influence integration and utilization of visual cervical cancer screening service. Six reproductive clinics were sampled for the study out of the nineteen in the Sub-County and a total of 354 respondents visiting the sampled reproductive health clinics. Questionnaires, checklist and key informant interviews were used to collect data. Chi-square and Fisher exact test were used to test significant associations with a $P \leq 0.05$ being considered significant while qualitative data was analyzed and discussed in key thematic areas. The sampled reproductive health clinics had the required screening resources, however only 20 per cent of the respondents had ever been screened for cervical cancer at the time of this study. The opportunistic screening approach, low level of awareness, inexistence of a functional referral system, poor reporting, monitoring and supervision on visual screening were key screening challenges among others. The study concluded that, establishing clinical services alone will not achieve the desired screening target unless critical components are put in place to address the observed challenges in this study.
ASSESSING THE NATIONAL SCHOOL HEALTH POLICY ON THE STATUS OF WATER, HYGIENE AND SANITATION IN PRIMARY SCHOOLS OF SABATIA, VIHIGA COUNTY, KENYA

KISHASHA MESHACK KIJUNGU – M.P.H

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Supervisors: Dr. J.P. Oyore

Dr. Peterson Warutere

School Health began in Kenya in 1960’s as an initiative of UNESCO and FAO as an intervention tool to encourage attendance and reduce malnutrition in school-going children. The introduction of free, Universal Primary Education (UPE) in 2003 increased pupil enrolment from 5.9 to over 7.8 million thus overstretching water, hygiene and sanitation facilities hence necessitating for a policy. In 2009, the Kenya Government developed the National School-based health program with its policy in eight health thematic areas whose goal was to enhance the quality of health in school communities by creating a healthy and friendly environment for teaching and learning. One of the key areas addressed by the program was water, hygiene and sanitation in primary schools. The purpose of this study was therefore to assess the current health status on water, hygiene and sanitation in primary schools and to identify the measures that are in place for prevention and control of diseases related to water, hygiene and sanitation in the schools. The study employed a cross-sectional research design that utilized both quantitative and qualitative paradigms. Probability sampling design was used which employed both cluster and simple random sampling techniques in the selection of the schools and the study participants respectively. The study captured a randomly selected sample size of 31 out of 102 schools in the district for study. All the 31 schools were assessed on the compliance to national school health policy and guidelines; 31 FGDs and 3 KII were undertaken to identify barriers to implementing good hygiene, sanitation and provision of safe water for use in schools. The study identified gaps with regards to the status of water, hygiene and sanitation. There was insufficient (3%) quality surveillance and monitoring for water safety in schools. The pupil-toilet ratio was grossly inadequate at 50:1 against the recommended 30:1 for schools. Forty percent of the toilets were found to be dirty. There was significant statistical association between sources of water and diarrhea diseases among pupils in schools (p<0.0019). However, the following were identified in FGDs and KII; insufficient supervision by health and water authorities, lack of partnerships with local businessmen, local community and politicians to help build enabling structures for school health. The research concluded that there were potential risks for disease transmission in schools given the current status of water, hygiene and sanitation. The study therefore rejected the null hypothesis and that there was no existence of the policy.
document in all schools. The study recommended that there was dire need for schools to liaise with the national and county governments to develop and form an effective implementation Board that would oversee and enforce the national school health policy and programs. The key contribution of this study was to provide baseline data on school health for future planning, interventions and facilitate sound policy implementation of the National Comprehensive School Health Program.

UTILIZATION OF HIV SERVICES AMONG MEN-WHO-HAVE-SEX-WITH MEN IN NAIROBI COUNTY, KENYA.

KIPLAGAT ANTHONY BUNDI - M.P.H
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Dr. Peterson Warutere

The new constitution promulgated in 2010 clearly state every Kenyan without discrimination is entitled to the highest attainable quality of health care, which is not reflected with the current challenges men-who-have-sex with- men continue to face in the sexual health service utilization. Kenya struggles in its response to this ongoing crisis amongst MSM in many areas including disease prevention, treatment, and HIV related stigma, prejudice, and discrimination. Currently little information is reported on MSM health services utilization. The wider spread of STIs including HIV beyond the MSM community is real hence need for urgent intervention. Therefore, the overall aim of this study was to assess HIV services utilization among MSM in Njiru Sub-County, Nairobi County. This study used a descriptive cross-sectional study design employing both quantitative and qualitative methods of data collection. Snowballing sampling technique was used to sample 149 respondents who participated in this study while purposive sampling design was used to select and interview 15 key informants. Descriptive, chi-square and binary regression was used to analyze quantitative data from study survey using SPSS while qualitative data from key informants was analyzed thematically using Nvivo. On utilization, findings revealed that 86% of MSM had sought HIV services within the last 6 months. Self-reported HIV prevalence rate among MSM was 53%. On patterns of utilization, NGOs programs and outreaches were the most preferred centers due to their user-friendliness. In relation to knowledge, 86% of MSM had correct knowledge on HIV transmission and prevention. There was a statistically significant relationship between access to health information on transmission and prevention of HIV/AIDS (p=0.001) and utilization of HIV services. In terms of sexual behavior, 67% of the MSM had engaged in unprotected sex with about 63% of MSM engaging in sex for a pay. There was a statistically significant relationship between exposure to
unprotected sex ($p=0.010$), regular use of condoms during sex ($p=0.05$), involvement in sex for a pay ($p=0.021$) and utilization of HIV services. In relation to health system factors, about 50% of MSM had experienced stigma, discrimination and dismissive attitude from health staff when seeking HIV services. There was a statistically significant relationship between denial of services based on sexual orientation ($p=0.001$), mistreatment by health staff ($p=0.043$), experience of discrimination at service delivery points ($p=0.025$), discrimination by community members ($p=0.025$), awareness of anti-same sex laws ($p=0.004$), privacy and confidentiality ($p=0.022$), friendliness of health staff ($p=0.001$), access to adequate HIV/AIDs information ($p=0.036$), perceived quality of HIV services ($0.032$) and utilization of HIV services. In conclusion, there was a high HIV prevalence rate among MSM partly due to their risky sexual behaviours. There is a high risk of vertical and horizontal HIV transmission among the group due to existence of multiple male and female sexual partners. Currently, MSM are facing increasing stigma, discrimination and dismissive attitude which limit their ability to demand and utilize HIV services. Therefore, there is need to enhance programs which advocate and promote safe sexual behaviours among MSM, reduce stigma and discrimination of MSM to enhance their willingness to use HIV services.

**MORBIDITY OF DIARRHEAL DISEASE AMONG CHILDREN AGED UNDER FIVE YEARS LIVING IN INTERNALLY DISPLACED POPULATION CAMPS OF HODAN DISTRICT, MOGADISHU-SOMALIA**

HAWA ALI WARSAME – M.P.H

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The last two decades of armed conflicts, lack of functioning government, economic collapse, and disintegration of the health system and other public services - together with recurrent droughts and famines, have turned Somalia into one of the world’s most difficult environments for survival. The under-five mortality in Somalia is estimated at 200 deaths per 1,000 live births, which is one of the highest in the world. Diarrhea is the main killer; contributing to 20-25 per cent of all under-five mortality. The main objective of this study was to assess the morbidity of diarrhea among under-five children living in Internally Displaced Persons (IDPs) of Hodan district which has the highest IDP settlement in Mogadishu with conditions that are conducive to occurrence of diarrheal disease in the district. The study used descriptive cross-sectional survey design and multistage sampling technique to select 236 children. Researcher administered structured questionnaires were used to collect data using face-to-face interviews with
mothers/care givers of the children during a one-time visit to the households. Data was analyzed using the Statistical Package for Social Sciences (SPSS) version 21 software. Descriptive and inferential statistical findings were presented in form of text, tables, graphs and charts. Chi-square was used to show the relationship between variables. Forty-eight percent of households reported having children who suffered from diarrhea in the past 2 weeks preceding the study. Diarrhea was also the most common disease reported by mothers/care givers among under-five children in the camps, affecting 107 (45.3%) of the children. Diarrheal disease occurrence was highest (74.3%) among children of mothers who did not attend school \((p=0.001)\), children living in households provided water by Non-Governmental Organizations (NGOs) \((p=0.025)\) and among children whose main source of water was public tap diarrhea (71.3%; \(p=0.001\)). Most parents in the camp delayed taking their ill children to hospital opting to first use traditional medicines resulting in many cases of admissions at the health facilities. From the study findings it can be concluded that diarrhea was the most prevalent disease among under-fives and is more likely to occur among children whose mothers had no education, and who lived in household whose main source of drinking water was public tap, supplied by NGOs. In addition, the study concluded that other environmental factors had no association with diarrhea occurrence. The study recommends educating mothers to reduce overall illiteracy rate of Somali women, and regular treatment of drinking water and evaluation of water quality by the Ministry of Health and Human Services. Given the high diarrhea prevalence and the fact that camp environmental conditions are conducive to its occurrence, the study also recommends promotion of improved hygiene and sanitation practices, even though these were not found to be associated with diarrhea in this particular study.

**DETERMINANTS OF HEALTH FACILITY CONSULTATION FOR ACUTE RESPIRATORY INFECTION AMONG CHILDREN UNDER FIVE YEARS IN GITHUNGURI SUB – COUNTY, KIAMBU COUNTY, KENYA**

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Dr. Florence Nafula Okwara
There were an estimated 5.9 million deaths among children under five years in 2015, with infectious diseases accounting for almost half (51.8%) of these deaths. Pneumonia was the leading cause of infectious deaths, with 60% cases concentrated in 10 countries in Sub-Saharan Africa and South Asia. In 2014, pneumonia was the leading cause of death among children under five years in Kenya. Kenya is one of the countries that have not yet adopted community management of pneumonia as recommended by UNICEF/WHO in 2013. As such, management of pneumonia cases remains health facility based. Much delay however, has been observed by caregivers in seeking care at the health facilities. This study sought to establish the determinants of health facility consultation among caretakers of children under five years of age with ARI. This was an analytical cross-sectional study carried out in Githunguri Sub-County from November to December 2014. A total of 323 mothers of children under five were included in the study. Simple random sampling was used to select the study participants. The dependent variable was “timing of health facility consultation for ARI”. Structured questionnaires were used to collect data on socio-demographic and household factors, pneumonia knowledge and facility factors. Focused Group Discussions and Key Informant Interview guide were used to collect qualitative data. Informed consent was sought from the study participants. Data was analyzed using Statistical package for social sciences (SPSS) software version 20. Univariate, bivariate and multivariate analysis was done to show frequency distributions and associations between variables. The prevalence of ARI in Githunguri Sub-County among children under five years was 240 (74.3%). More than half 149 (62.1%) delayed consulting a health facility for ARI. Caretakers delayed seeking care for their female child than their male child (p = 0.036). There was more delayed facility consultation for ARI when fathers made on care seeking compared to mothers (p = 0.016). Poor knowledge of pneumonia symptoms was associated with delayed health facility consultation (p = 0.007). Facility factors that influenced health facility consultation were, high cost of care in the previous facility visit (p = 0.011) and long waiting time before assistance at the health facility (p = 0.023). On logistic regression, the strongest determinant of “health facility consultation for ARI” was having waited for >1 hour before service provision (delayed assistance) at the health facility (OR = 0.25; C.I (0.12- 0.56); p = 0.001). In conclusion, delayed health facility consultation is rampant in this community, mainly due to perceived long waiting time before service provision at the health facility. The study therefore, recommends need to devise strategies to improve efficiency of services at all tiers of health care by the Ministry of Health. In addition, there is need for health education on recognition of pneumonia symptoms and on prompt appropriate care seeking to caretakers by the County health officers.
TREATMENT COMPLIANCE AMONG WOMEN WITH PREGNANCY INDUCED HYPERTENSION ATTENDING SELECTED HEALTH FACILITIES IN RACHUONYO NORTH SUB-COUNTY, HOMABAY COUNTY, KENYA.

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Treatment compliance among pregnant women with pregnancy induced hypertension (PIH) continues to be a major global health challenge. Maternal and infant mortality and morbidity remain high and PIH is one of the leading causes. However very little has been achieved to bring this condition under control and many mothers and newborns continue to die or suffer many complications. The main objective of this study was to assess treatment compliance among women with PIH in Health Facilities within Rachuonyo North Sub-County Homa-Bay County. The specific objectives were to establish the socio-demographic factors that influence treatment compliance among women with PIH, to determine the knowledge level of women with PIH and to establish the health system factors influencing treatment compliance among women with PIH in Rachuonyo North Sub-county. A cross sectional descriptive study was undertaken targeting pregnant women already diagnosed with PIH in selected Health Facilities within Rachuonyo North Sub-County. Data collection tools used was researcher-administered questionnaires, FGD guides and KIIs. The questionnaires were filled by 175 women who were proportionately allocated the 3 Level 4 health facilities in the Sub-county. Within each health facility, pregnant women with PIH were conveniently sampled. Two doctors, two clinical health officers and two Nurses were used as key informants to provide additional information. The association between the variables was assessed using Chi Square and logistic regression. The level of treatment compliance among women with PIH stood at 18.3%. Among the women with PIH, 68.1% had high knowledge on treatment compliance. Socio-demographic factors that were significantly associated with treatment compliance were age (p-value = .007) and highest level of education attained respondents (p-value = .038). On the health system factors; explanation of PIH during diagnosis (p-value = .001), advice on the importance of taking PIH medications (p-value = .025), explanation on schedule and timing of taking medications (p-value = .024) and frequency of follow up (p-value = .001) were significantly associated with treatment compliance. However education level was the only significant factor that could predict treatment compliance with respondents who had completed primary schools were 4.968 (Adjusted Odds Ratio = 4.968, p-value = .05) times more likely to comply with PIH treatment as compared to respondents who had not completed primary. The study findings are useful for planning and designing appropriate intervention by the Ministry of Health, Non-governmental organization and stakeholders in order
to create awareness about treatment compliance among pregnant mothers with PIH so as to avert the trend and prevalence of Pregnancy Induced Hypertension.

ASSESSMENT OF HIV-POSITIVE POSTNATAL CLIENTS’ SATISFACTION WITH PREVENTION OF MOTHER-TO-CHILD TRANSMISSION SERVICES AT KENYATTA NATIONAL HOSPITAL, NAIROBI, KENYA

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In the era of HIV and AIDS global pandemic, clients’ satisfaction is one of the outcome measures for the free PMTCT services and HIV/AIDS care. Despite increasing availability and accessibility to free PMTCT services in Kenya, there is inadequate information on clients’ satisfaction with PMTCT services. This study aimed at establishing the levels of HIV-positive postnatal clients’ satisfaction with PMTCT services offered in post pregnancy clinic at Kenyatta National Hospital, possible influencing factors and improvement strategies to enhance achievement of desired clients’ satisfaction. A descriptive cross sectional study was conducted for HIV-positive postnatal clients. A simple random sampling was used to obtain 139 participants at service exit after considering formulated eligibility criteria (exclusion and inclusion). Quantitative data was collected by use of in-depth exit interviews and focus group discussions. Data was processed using SPSS software version 22 to test hypothesis and explain relationships. Results were considered significant when p-value was equal or less than 0.05. The results revealed that integrated PMTCT services were offered in every clinic appointment. Results from Chi-square test were further confirmed by use of logistic regression analysis that showed that; waiting time ($p<0.01$), resources and infrastructure ($p<0.01$), clients’ level of knowledge of HIV ($p<0.01$), health providers’ attitudes ($p<0.01$), provider-client communication ($p<0.01$), psychosocial support and stigma ($p<0.01$) were found to have influenced clients’ satisfaction with the PMTCT services. The study findings enabled the rejection of null hypothesis and adoption of alternative hypothesis. Overall, the study results revealed that majority (86/139) of the respondents were satisfied with PMTCT services offered while more than one third of the respondents (53/139) were dissatisfied. Clients’ satisfaction was associated with staff understanding of clients’ needs, desires, expectations and concerns, quality of services or care received, adequate counseling, strong psychosocial support services and quality laboratory services. The clients’ dissatisfaction was associated with long waiting time, delayed laboratory investigations, pharmacy being located far from the clinic, high cost incurred when travelling to seek for PMTCT services from their residential zones, inadequate privacy and confidentiality etc. The study yielded a range of new insights on strategies for achieving desired
satisfaction with PMTCT services such as reduction of waiting time, performance and quality improvement, improved infrastructure and supply of relevant resources, improved integration and organization of relevant services such as partner involvement, child healthcare, HIV testing services etc. The improvement strategies will enhance efficiency and effectiveness in provision of PMTCT services as indicated in the national guidelines. The study recommends that stakeholders of PMTCT program embrace and implement the proposed improvement strategies, facilitate similar studies in future throughout the country to identify experiences, service quality gaps and model best practices for sharing among stakeholders to strengthen PMTCT program in the country.

INFORMATION SEEKING BEHAVIOUR AMONG HEALTH PROFESSIONALS IN PUBLIC HEALTH FACILITIES IN GARISSA COUNTY, KENYA

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Information is inevitable in the health profession. The need to become informed and knowledgeable which leads to “information seeking behaviour processes” is important among qualified health professionals who have vital roles in achieving health goals of a given country. However, in Kenya, little effort have been made in understanding the information seeking behaviour of health professionals compared to effort made towards developing new information technologies. Therefore, the general objective of this study was to assess information seeking behaviour among health professionals in public health facilities in Garissa County. The specific objectives included: to establish the socio-demographic characteristics influencing information seeking behaviour of health professionals in Garissa County; to determine facility factors influencing information seeking behaviour of health professionals in Garissa County; to establish technological factors influencing information seeking behaviour of health professionals in Garissa County; to determine information needs of health professionals in Garissa County. The study used a cross-sectional study design employing mixed methods of data collection. Stratified sampling was used to select a study sample of 222 health professionals to participate in the study while purposive sampling was used to select participants for Key Informant Interviews and Focus group discussions. Descriptive and multinomial logistical regression was used to analyze quantitative data using SPSS version 20 while thematic analysis was used to analyze qualitative data from Key Informant Interviews and Focus group discussions. Results showed that mority of health professionals (86%) sought information only when and work experience (P=0.013) had a statistically significant relationship with information seeking behaviour. Among the facility factors, workload (P=0.000), and information sharing (P=0.0000) had a statistically significant relationship with information seeking behaviour. Among technological factors, computer
proficiency (P=0.000), ability to search information from internet (P=0.000, ability to analyze and interpret digital data (P=0.000) and internet connectivity (P=0.001) had a statistically significant relationship with information seeking behaviour. In conclusion, there is insufficient effort made to understand information behaviour and address information needs of health professionals in Garissa County. There is need for both national and county governments (including other key stakeholders) to develop supportive policies and programs which encourage a culture for improved information seeking behaviour among health professionals by promoting initiatives which address the key issues influencing information seeking behaviour.

HEALTH SEEKING BEHAVIOR AMONG NURSES WORKING IN PUBLIC HOSPITALS IN KAKAMEGA COUNTY, KENYA.

NEBERT K. MCHIDI – M.P.H

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Supervisors: Dr. Andre Yitambe

Prof. B.M. Okello Agina

Health seeking behaviour refers to actions undertaken by a person who perceives self to be ill for the purpose of finding an appropriate remedy. Nurses as gate keepers of health are expected to seek formal treatment when they are taken ill because this is what they teach and expect of their patients. Their working conditions world over have been described as squalid with long working hours, often cited as accruing from workload and the general nature of nursing work, a scenario that predisposes them to occupational health hazards at the same time denying them time off to look after their own health. Nurses are knowledgeable about disease and its treatment, have access to health care and health insurance. However, there is evidence that nurses engage in self treatment and kerbside consultations, a complete contrast of what they expect of their patients. It is in this regard that health seeking behavior among nurses in Kakamega County was investigated. The main objective of the study was to explore health seeking behaviour among nurses working in public hospitals in Kakamega County. A cross-sectional study was carried out in Kakamega County. Data was collected using self administered questionnaires and subjected to univariate, bivariate and binary logistic regression analysis. The study found that 62% (n=116) of the nurses utilized formal health care when they were last ill, 33% (n=61) engaged in voluntary screening services and 34.8% (n=65) said that they knew their health would be better if they engaged in health promotion activities. Majority, 70% (n=81) of the females utilized formal health services as opposed to 30% (n=35) of the males. Increasing nursing education seemed to drive informal treatment, as 79.3% (n=92) of those with a diploma and below utilized formal
care as opposed to 20.7% (n=24) of the nurses with a higher diploma and above. Further, there was a significant association between predisposing factors of number of years worked as a nurse ($\chi^2 = 6.072$, df= 1, p=0.014); and support nurses receive from the immediate supervisor ($\chi^2 = 5.068$, df= 1, p=0.024) with health seeking behavior. There was also a significant association between enabling factors of satisfaction with health services accessible to nurses in the County ($\chi^2 = 8.548$, df= 1, p=0.003) and the quality of health services in the County ($\chi^2 = 8.680$, df= 1, p=0.003) with health seeking behavior. Finally, there was a significant association between the need factors of severity of illness ($\chi^2 = 8.628$, df= 1, p=0.003) and current general health ($\chi^2 = 8.086$, df= 1, p=0.004) with health seeking behavior of nurses. The study also found that nurses whose general health was good were less likely to use formal care ($\beta=-0.822$, OR= 0.439, p= 0.044, 95% CI= 0.197-0.979). The study concludes that the predisposing, enabling and need factors are significant in explaining the health seeking behavior of nurses in Kakamega County and recommends empowering young and male nurses to utilize formal care through education. It also recommends that the County involves nurses in investing in quality health care.

MUSCULOSKELETAL PAIN AND SCHOOL
BAG USAGE AMONG UPPER PRIMARY SCHOOL-GOING CHILDREN IN NAIROBI CITY COUNTY, KENYA

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Dr. Lucy Joy Wachira

There has been a growing concern on the effect of heavy backpack on health among school going children who are at an important stage of their growth and development. Grade-based learning has pushed many students to carrying heavy backpacks hence leaving them exposed to musculoskeletal problems. The objective of this study was to measure the backpack weight carried by pupils in Starehe sub-county in order to assess the effects of backpack weight on musculoskeletal pain. A descriptive cross sectional design was used. The study population comprised upper primary school going children in Starehe Sub –county, Nairobi County. Systemic random sampling method was used in selection of schools and school going children using backpacks. A sample of 379 school going children was selected from 6 public and 2 private schools in the Sub- County. Structured interviews, observation checklists, and Cornell
Musculoskeletal Discomfort Questionnaires (CMDQ) were used to capture data on musculoskeletal pain and backpack use. Pretest of the tools was conducted in one primary school in the Sub –county. Validity and reliability of the instruments was tested through Visual Analogue Scale (VAS) and Kappa statistics for CMDQ. The research assistants were trained on use of the tools and verification was done for completeness of the instruments during data collection. Data analysis was done using SPSS version 21. Statistical significance was set at 0.05. Descriptive and inferential statistics, that is, frequencies, mean, chi square and logistic regression were used in data interpretation. Majority of pupils (73.6%) complained of musculoskeletal pain. Low back pain (25.1%) was the most prevalent musculoskeletal pain followed by neck pain (16.9%). Very few pupils (0.8%) experienced pain in their right wrist. There was a significant association between backpack weight to schoolchild body weight (BTSW%) and the presence of musculoskeletal pain (p<0.05) with the proportion of pupils carrying school bag weighing more than 15% of their body weight being 28%. The results also revealed that most pupils (71.2%) did not take a break from carrying their backpacks. This study concluded that school children who carry backpacks that weigh more than 15% of their body weight (BTSW%) are at risk of experiencing musculoskeletal pain. It is recommended that the backpack weight percentile be reduced to less than 15% body weight of the school going child.

DETERMINANTS OF CONTRACEPTIVE CHOICES AMONG HIV POSITIVE WOMEN OF REPRODUCTIVE AGE ATTENDING COMPREHENSIVE CARE CENTRE AT KITALE COUNTY REFERRAL HOSPITAL, KENYA.

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Dr.John G.Kariuki
Family planning is an important aspect of primary health care. In order to improve the efficacy of available contraceptive methods, it is of importance to identify factors influencing women’s choice of contraception. In Kenya, like many other sub-Saharan countries, prevention of unintended pregnancies among HIV positive women as a strategy for PMTCT has been neglected. This has resulted in a large population of HIV positive women who have a substantial degree of unmet need for family planning, estimated at 60% in the 2007 Kenya Aids Indicator Survey. This study focused on exploring the various determinants of contraceptive choices among HIV positive women of reproductive age seeking services at comprehensive care centre, Kitale County Referral hospital, Trans Nzoia County. The specific objectives for this study were to determine the knowledge levels, to determine the types of modern contraception used and to assess the factors that influence contraceptive choices among HIV positive women of reproductive age attending comprehensive care centre at Kitale County Referral Hospital. This was a cross-sectional descriptive study of 357 randomly selected HIV positive women where both quantitative and qualitative information was collected. The research instruments used were a questionnaire, key informant interview guide and a focus group discussion guide. The data was analyzed using Statistical Package for Social Sciences (SPSS V.20). Statistical techniques including Chi square, and logistic regression were used in the analysis. P<0.05 was considered significant. The findings showed that more than half of HIV positive women 182 (52.1%) were using hormonal modern contraceptives. Controlling for occupation, age, religion, access to contraceptives and facing challenges were significant determinants of contraceptive choice (p<0.05). Those below 30 years were less likely to choose non-hormonal contraceptives compared to those 30 years and above (OR; 95%CI: 0.341; 0.195-0.598). Those affiliated with catholic religion were 2 times more likely to choose non hormonal contraceptives compared to Protestants (OR; 95%CI: 2.226; 1.192-4.158). Those accessing contraceptive at the CCC were 11 times more likely to choose non-hormonal contraceptives compared to those accessing from other places (OR; 95%CI: 11.265; 2.914-43.551). Those experiencing challenges in accessing contraceptives were 6 times more likely to choose non-hormonal contraceptives compared to those not (OR; 95%CI: 6.246; 1.410-27.673).In conclusion, choice of contraceptive was strongly related to age, religion, access and challenges. There is need for the Governmental and nongovernmental organizations, health facilities and other stakeholders to ensure availability, accessibility and sustained advocacy for use of appropriate contraceptive methods. This will guarantee contraceptive commodity security and sustained demand for contraception among HIV positive women of reproductive age. There is also need for researchers to investigate husbands’ perception and acceptance towards contraceptive use by their partners.

PREDICTORS OF FAMILY PLANNING SERVICES UPTAKE AMONG WOMEN OF REPRODUCTIVE AGE IN MOYALE SUB-COUNTY, KENYA

FRANCIS KYALO MUEMA – M.P.H
Family planning (FP) is one of the fundamental pillars of safe motherhood and a reproductive health right. However, the Northern arid lands of Kenya, where Moyale Sub-County lies, have continued to record low levels of family planning services uptake. This situation has led to poor health outcomes among women, children and the general population thus poor progress towards achievement of Millennium Development Goals (MDGs). Consequently, this study set out to determine the modern contraceptive methods used by the women, the level of unmet need for FP services, the total demand for FP services and the influence of socio-demographic, economic and cultural factors on FP uptake among the women. The study employed a cross-sectional descriptive design. Stratified two stage random sampling method was used to obtain a sample of 170 respondents who were drawn from women visiting health facilities in the sub-county. Data was collected through interviews with randomly selected respondents, key informants, and focused group discussions. Informed consent was sought from all participants with confidentiality and privacy being maintained throughout the study. Data analysis for the quantitative and qualitative data was carried out using computer Statistical Package for Social Sciences (SPSS Version 20) and content analysis respectively. Chi-square was used to measure significant associations between independent and dependent variables with $P < 0.05$. Binary logistic regression analysis was used to determine the independent predictors and their contribution to FP uptake. The findings from this study showed that the prevalence of contraceptive uptake is 54.7%. Close to half of the respondents 45.3% were not using any contraceptive method. The total unmet demand for FP was found to be 24.8% while the total demand for FP was 79.8%. The significant predictors of FP uptake were experience of child loss ($O.R = 0.183; P = 0.001$), affiliation to Islamic religion ($O.R = 4.036; P = 0.026$), preferred number of children ($O.R = 0.380; P = 0.039$), inter-spousal communication ($O.R = 5.500; P = 0.045$), husbands education level ($O.R = 7.598; P = 0.022$), joint FP decision making ($O.R = 4.992; P = 0.020$) and social group approval ($O.R = 4.495; P = 0.001$). This study recommends creation of awareness and advocacy on benefits of smaller family sizes in the Sub-county, improved access to at least secondary education in the general population, FP campaigns and outreaches at the rural communities and women who have experience of child loss, formation of FP advocacy social groups and utilization of existing social groups for channeling FP messages to the community. The study further recommends strengthening and mainstreaming of male involvement and religious leaders participation in FP interventions and initiation of a communication program that explicitly promotes inter-spousal communication.
PREVALENCE AND FACTORS ASSOCIATED WITH BRUCELLOSIS AMONG COMMUNITY MEMBERS IN MANDERA COUNTY, KENYA

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Brucellosis is an infectious debilitating, acute or sub-acute febrile illness usually marked by an intermittent or remittent fever accompanied by malaise, anorexia and prostration, and which, in the absence of specific treatment, may persist for weeks or months. The aim of this study was to determine the prevalence and factors associated with brucellosis among community members in Mandera East Sub-County, Mandera County. The study was descriptive cross sectional study which collected both qualitative and quantitative data from where a sample of 420 respondents was systematically selected from heads of 2,617 households form Mandera East Sub-county. The study instruments included questionnaire, Focus Group Discussion guide and Interview Guide. Blood samples were screened for brucellosis using Rose Bengal Plate Test (RBPT) and the positive sera were subjected through Serum Slow Agglutination Test (SSAT) which acted as a confirmatory test. Data was analyzed using SPSS Version 20 and results of the study presented in frequencies and percentages in Tables and Figures. Ethical clearance was sought from Kenyatta University Ethical Clearance Committee, permit to carry out the study was sought from NACOSTI and consent sought from the respondents. Rose Bengal Plate Test (RBPT) indicated a prevalence of 24.8% (95% CI: 20.0–29.6) and Serum Slow Agglutination Test (SSAT) indicated that the prevalence was at 14.3% (95% CI: 8.7–19.9) among the respondents. The study showed that the seroprevalence was higher among the male respondents (98%; n=103) as detected through RBPT and (98%; n=57) confirmed through SSAT. There was significant relationship between the gender and seroprevalence as tested through RBPT (P<0.001) and through SSAT (P<0.001). It further showed that the majority of the respondents (69%) was aware of the disease and that 31% (n=130) took fermented milk without boiling, while only a few (6%; n=25) of respondents pasteurized it. There was a significant relationship between the respondents’ milk preparation practices before consuming and brucellosis status using RBPT ($\chi^2=17.115; df=4; p=0.002$) but not when tests were done through SSAT ($\chi^2=8.737; df=4; p=0.068$). Factors associated with the spread of brucellosis among the community members in Mandera East Sub-county included directly getting into contact with animals such as goats, cows, wild animals
dogs, camels, and sheep and taking poorly prepared milk; consuming raw blood from livestock; taking raw or poorly cooked meat and getting involved in various activities touching on livestock. Scaling up of awareness of brucellosis among the community members was required. This can be done by the relevant Ministries in County government of Mandera and the Ministry of Health and of Livestock should evaluate a possibility of undertaking brucellosis campaign.

Ph.D

EFFECTS OF PUBLIC HEALTH INTERVENTIONS ON INTESTINAL PARASITIC INFECTIONS AMONG SCHOOL-GOING CHILDREN IN MURANG’A COUNTY, KENYA

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Intestinal parasitic infections have been found to form at least a quarter of all human infections globally. School-going children are the worst affected by these infections as it impairs their growth and cognitive development. Following the WHO recommendation, the Government of Kenya rolled out a school deworming programme under the School Health Programme in 2009.
The study was embedded in the School Health Programme. The main objective of the study was to investigate the effects of public health interventions against intestinal parasitic infections among school going children in Murang’a County. It was a quasi-experimental study with schools assigned to intervention and control groups. The schools were selected through multi-stage sampling. Data was collected in three phases: baseline, intervention and post intervention evaluation. A total of 446 pupils from six primary schools provided stool samples for examination of intestinal parasitic infections. Structured interview guides and observation were used to collect more information on school sanitation, pupils’ hygiene practices and their level of knowledge of intestinal parasites. Qualitative data was collected through Key Informants Interviews and observations of school sanitation and hygiene practices compared with School Health Policy. Installation of tippy taps, provision of soap and water, and health education were some of the public health interventions which were implemented in intervention group. A post intervention evaluation was conducted to determine the effect of these interventions. Data was analyzed using SPSS version 20. Association of variables was tested using chi-square while t-test was used to compare means. At the baseline phase the overall prevalence of intestinal protozoan infections was 51.2% and 55.1% in the intervention and control group respectively. Prevalence of intestinal helminthic infections was 12% and 16.5% in intervention and control groups respectively. A comparison of mean percentage of infected pupils at baseline revealed that there was no statistically significant difference in the prevalence of intestinal parasites between intervention and control groups (t =0.32, P = 0.37). Level of knowledge of intestinal parasites was 52.3% and 48.8% in the intervention and control group respectively. The difference between the two was not statistically significant (Χ²= 3.4, df = 5, P=0.13). There was a statistically significant relationship between protozoan infections and school sanitation (Χ²= 10.3, df = 1, P = 0.001). Association between helminthic infections and school sanitation was also found to be significant (Χ²= 2.4, df = 1, P=0.01). Key informants interview revealed that there were no health clubs at schools through which health promotion would be propagated among the pupils. After intervention a comparison of mean percentage of infected pupils revealed that there was a statistically significant reduction in intestinal protozoan infections in intervention group from 55.1% to 6.0% (t=12.6, P=0.001). There was also a statistically significant reduction in the prevalence of helminthic infections in the intervention group from 12.4% to 0.0% (t = -3.78, P<0.001). This has led to the conclusion that public health interventions influenced the reduction of the prevalence of intestinal parasites. The findings of this study are useful to the ministry of Education in formulating policies that will shape the future of the School Health Programme in Kenya. There is a suggestion to conduct a community based study to rule out the infections from the home environment.
HEALTH BURDEN OF WILDLIFE INDUCED INJURIES AMONG THE MAASAI CATTLE HERDERS IN KAJIADO COUNTY, KENYA

ISAAC KASILU MAKAU – Ph.D

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Wildlife induced injuries are a major but neglected emerging public health problem which contributes significantly to high mortality and morbidity among cattle herders. The objectives of the study were to determine the health burden of wildlife induced injuries, to identify the risk factors and establish the risk indices associated with wildlife induced injuries and to determine the protective measures adopted to mitigate wildlife induced injuries among the Maasai cattle herders in Kajiado Central and Loitokitok sub-counties. The study adopted a descriptive cross-sectional study design and mixed methods where quantitative and qualitative data were collected. Multi-stage sampling method was used. A total of 262 respondents were sampled for this study. The data collection tools used in this study included researcher administered questionnaires, Focus Group Discussions (FGDs) and key informant interviews (KIIs). Questionnaire was pre-tested be to ensure validity and reliability. Quantitative raw data from the field was checked for errors and completeness, through editing of responses. The cleaned data was exported to Statistical Package for Social Sciences (SPSS) software version 22 and Disability-Adjusted Life Years (DALYs) software for analysis. Descriptive statistical analysis was used to reveal the distribution of tendencies in the sample data. Descriptive statistics namely frequency tables and percentages were used to describe, organize and summarize the study findings. Chi-square test was used to establish if associations existed between study variables. A p-value of ≤ 0.05 was considered significant. Multivariate Analysis of Variance (MANOVA) was used to the association between risk factors and wildlife induced injuries. Multiple Discriminant Function Analysis (MDFA) was used to determine the linear relationship between variables. Study findings show that wildlife induced injuries accounted for a total of 3,352 DALYs among cattle herders in Kajiado Central and Loitokitok sub-counties. Of this, 1,988 DALYs resulted in male Maasai cattle herders and 1,364 DALYs resulted in female Maasai cattle herders which indicate that male Maasai cattle herders lost more healthy years of life due to cattle herding than female Maasai cattle herders. Overall evidence generated from the study will be used to influence policy and direct focus on interventions geared towards addressing public health issues of significance to the poor Maasai cattle herders.
Maize is an important staple food for most Kenyans. The increasing population trend in the face of declining yields in maize production has intensified food insecurity countrywide. The low grain yield can be attributed to foliar diseases mainly gray leaf spot and maize streak virus and expensive hybrid seeds. Hybrid testing is expensive and limited in number of hybrids that can be generated and tested each year. This has increased the need to improve maize production techniques to meet the high demand. Assigning germplasm into different heterotic groups is fundamental for exploitation of heterosis for hybrid development within a shorter period thus reducing the cost. The objectives of this study were to identify good hybrids based on grain yield data and other yield related traits, to estimate the specific combining ability and percentage heterosis of hybrids formed and identify lines with good combining that can be used as parents in hybrid combination and classify the selected KALRO lines into heterotic groups. Eleven inbred lines were crossed with two single cross testers MU021 and MU022 developed by Kenya
Agricultural and Livestock Research Organization (KALRO) Muguga South and belonged to heterotic groups A and B respectively. Line by tester design was used for making crosses. Twenty two crosses were evaluated in a randomized incomplete block design (RIBD) with two replications during the long rainy seasons between March and November 2012. The study was carried out in two different sites, at KALRO Muguga South and KALRO Embu. The parameters measured included plant height (cm), ear height (cm) and grain weight per plot in grams. Disease scores for gray leaf spot (GLS) and maize streak virus (MSV) were recorded and analyzed using Kruskal-Wallis Test. Data collected on plant height, ear height and yield were analyzed by Analysis of Variance (ANOVA) using Genstat programme 2012 and means separation was done using Tukey’s 95% confidence intervals. Heterosis, general combining ability (GCA) and specific combining ability (SCA) were calculated using line by tester analysis. GCA mean squares due to lines and testers were highly significant $p<0.01$ for plant height and ear height. GCA effects indicated that V217-48, Z426-43Z387-4-1 and Z419-5Z443-3 were the best general combiners for grain yield. V131-303 showed significant negative GCA effects. The good yielders in Embu were Z426-43Z387-4-1 X MU021, Z419-5Z443-3 X MU022,V217-48 X MU021, V217-48 X MU022 S458-2-2-2 X MU022 and V131-201 X MU021. In Muguga, the best performance were EC573(R12) Cross combinations S458-2-2-2 X MU021 or S458-2-2-2 X MU022 did well in the two counties. Inbred lines; V217-48 and V265-4-1 were resistant to both maize streak virus and Gray leaf spot in Muguga while inbred lines: Z419-5Z443-3, S458-2-2-2 and V131-201 showed resistance to both MSV and GLS. Total GCA mean squares were greater than SCA mean squares (GCA/SCA ratios of >1) indicating a preponderance of additive over non additive gene action. The basis of grouping the germplasm into different heterotic groups was specific combining ability (SCA) effects for grain yield. V131-303, Z426-43Z387-4-1, V217-48 and V131-201 showed negative SCA effects for grain yield with MU022 and were place into heterotic group B. EC573(R12)C853-14, V265-4-1, Z419-5Z443-3, V217-5, V265-80, REGN99/48-2 and S458-2-2-2 showed negative SCA effects for grain yield with MU021 and were placed into heterotic group A. The general, specific combining abilities and heterotic groups showed that these genotypes had a potential hybrids for advanced yield testing and subsequent release in the specific locations.

SUITABILITY ASSESSMENT OF EFFLUENTS FROM MWEA IRRIGATION SCHEME FOR REUSE IN IRRIGATION FOR RICE PRODUCTION, KIRINYAGA COUNTY, KENYA

ONDERRI JOSEPHINE NYABONYI – M.Sc

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Declining quantity and quality of irrigation water are serious challenges facing rice production in Mwea irrigation scheme. As such the aim of this study was to assess the suitability of effluents from the scheme for recycling for the same irrigation purpose within the scheme and areas downstream. Water from River Thiba intake (point 1) and waste water from Kiruara drain (point 2) and Thiba main drain (point 3) were sampled and analyzed for quality parameters thus:- pH, Electrical conductivity (EC), Total Dissolved Solids (TDS), Total Suspended Solids (TSS), Calcium, Magnesium, Sodium, Potassium, Bicarbonates and Nitrates. The results were used to compute Sodium Adsorption Ratio (SAR) and further compared to FAO irrigation water quality standards. Also soil samples from three fields adjacent to the water sampling points were analyzed for pH, EC, total organic carbon, total nitrogen, sodium, phosphorus, potassium, magnesium and calcium. In addition, a survey was conducted to obtain the socio-economic aspects of the rice farmers of the scheme. The results indicated that water and wastewater from all the three study sites were suitable for irrigated rice production based on FAO recommended standards of irrigation water. Wastewater recorded a positive progressive gain in all the parameters tested as point 1< point 2< point 3 for Ca, EC, TDS, TSS, Na, K and HCO₃ which were statistically significant (p<0.05). 88.3% of Mwea Irrigation Scheme farmers experienced water shortage during paddy rice production. It was also observed that already 51.5% of Mwea Irrigation Scheme farmers recycled wastewater/effluents from paddy fields and 50% of those who had not used wastewater said it was not available. The highest production was obtained from Karaba section with a mean of 27.9 bags of paddy rice /acre and farmers attributed this to the use of “enriched irrigation water.” Zinc and potassium were found to be too low in all the three soil samples tested but soil samples from the wastewater reuse site recorded gains in nitrogen and phosphorus indicating a deposition via wastewater. Though Nitrate concentrations in the three study sites were not significantly different (p>0.05), they were above 5mg/l which may cause damage to N sensitive plants and eutrophication in the receiving water masses. Also soil phosphorous levels of 30ppm at site 3 implies that farmers using wastewater at and beyond the Prison farm can do one rice season without applying P fertilizers hence a saving for them. Therefore, there is need for alternative disposal of these nutrient rich effluents and the best way is by recycling so as to; save the water masses downstream from eutrophication and growth of aquatic weeds, reduce cost of N fertilizers and obtain more water for expanding rice fields to increase rice outputs and reduce imports.
Effects of Integrated Soil Fertility Management and Tied-Ridging on Maize-Soybean Yields and Selected Soil Properties in Tharaka-Nithi County, Kenya

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Dr. Ngetich Kipchirchir Felix

Constraints to soil productivity include reduction in soil fertility and lack of adequate soil water conservation techniques due to erratic rainfall in central highlands of Kenya. This study evaluated effects of combining integrated soil fertility management options and tied-ridging on maize-soybean yields and selected soil properties during short rains in 2014 and long rains in 2015 seasons. The study was carried out in Kigogo primary school in Tharaka- Nithi County. The experimental layout was a randomized complete block design replicated 4 times. The treatments were: manure+fertilizer, tithonia+fertilizer, inorganic fertilizer, sole and control under tied ridging or conventional tillage. To evaluate effect of rotation on maize grain yield, 2 test crops: maize and soybean were alternated every season except sole maize treatment which was maintained throughout the trial period. Soil was sampled at 0-20 cm and 20-40 cm depths at the start and end of the study, and analyzed for soil pH, total N, available P, organic C and exchangeable bases. The data was subjected to analysis of variance using Genstat program and means were separated using Fishers’ LSD at \( p=0.05 \). Integrated soil fertility management technologies under soil water conservation tillage significantly increased both maize and soybean grain yields during short rains in 2014 \( (p \leq 0.037 \text{ and } p \leq 0.039 \text{ respectively}) \) and only maize grain yield during long rains in 2015 \( (p \leq 0.005) \). Further, tithonia+fertilizer and manure+fertilizer treatments under tied ridging significantly increased maize grain yields and soybean grain yields by 34.8\% and 43.5\% respectively compared to the control in long rains in 2015. Only tithonia+fertilizer under tied ridging increased significantly soybean grain yields by 57.1\% over control in short rains in 2014. Maize grain yield also has increased under maize-soybean rotation by 35.5\% over sole maize. The results showed significant decrease in soil pH, available P and total N in mineral fertilizer under tied ridging \( (p<0.05) \). Soil exchangeable K\(^+\), Ca\(^{2+}\) and Mg\(^{2+}\) generally increased in most treatments. This study recommends use of combination of either tithonia biomass or manure with inorganic fertilizer under conventional tillage as well as crop rotation to enhance soil fertility and maize-soybean yields in the region.
SEASONAL ABUNDANCE OF AMARANTH LEPIDOPTERAN DEFOLIATORS AND THE ROLE OF INDIGENOUS PARASITOIDS AND PHENYLACETALDEHYDE IN THEIR CONTROL IN NAIROBI COUNTY, KENYA

TITLE

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Amaranth is one of the African indigenous vegetables that is gaining popularity due to its nutritional, medicinal and economic values. Its potential as a source of food security in East Africa and most parts of the world has heightened demands for the once neglected crop. In Kenya and Tanzania, the Lepidopteran defoliators are important pests of the crop which can cause up to 100% yield loss. Little information on the population dynamics of these pests make their management difficult. Indiscriminate use of synthetic chemicals have raised environmental and health concerns creating a need for other environmentally safe and sustainable control strategies. The objectives of this study were to assess the seasonal abundance of the leaf webbers and their associated parasitoids, investigate the efficacy of Phenylacetaldehyde (PAA) as lepidopteran attractant and effect of amaranth lines on pest abundance. Damage by lepidopteran defoliators and performance of endoparasitoid Apanteles hemara on the two leaf webber species were also evaluated. Field experiments were set up at Kenyatta University and the International Centre of Insect Physiology and Ecology in a randomized complete block design with six replicates. Performance studies were carried out in the laboratory at ICIPE to assess the
acceptability and suitability of *Spoladea recurvalis* and *Udea ferrugalis* to *A. hemara*. Abundance of leaf webbers (*P*=0.537) and leaf worms (*P*=1.0) and their associated parasitoids (*P*=0.083) did not differ significantly between the wet (Nov, 2014-Jan, 2015) and dry (Jul-Sep, 2014) seasons. Phenylacetaldehyde plots had significantly higher number of leaf webbers than the control plots (*P*=0.014). Phenylacetaldehyde traps also attracted significantly higher number of moths than the traps in the controls in both dry and wet seasons (*P*<0.001). Both *S. recurvalis* and *U. ferrugalis* were accepted by and suitable for the parasitoid *A. hemara*. Successful oviposition was significantly higher (*P*=0.018) when *A. hemara* was reared on *S. recurvalis* and exposed to the same host than when reared on *U. ferrugalis* and exposed to *S. recurvalis*. Rearing host did not, however, significantly affect successful oviposition (*P*=0.782) when tested on *U. ferrugalis*. The sex ratio of the parasitoid was female biased when reared on *S. recurvalis* while on *U. ferrugalis*, it was male biased. Parasitism rate was significantly higher (*P*=0.025) in *S. recurvalis* (64.4%) than *U. ferrugalis* (48.6%). Non-reproductive mortality was not significantly different from natural host larval mortality in both *S. recurvalis* (*P*=0.782) and *U. ferrugalis* (*P*=0.115). These results show that lepidopteran defoliators of amaranths occur throughout the crop cycle calling for efficient and adequate management strategies. Abuk2 amaranths were shown to exhibit certain levels of non-preference by these pests hence should be targeted by breeding programs to produce resistant lines. High levels of parasitism exhibited by *A. hemara* on both *S. recurvalis* and *U. ferrugalis* makes it a suitable candidate for biological control of these leafwebbers in amaranth production.
EVALUATION OF CHICKPEA (*Cicer arietinum* L.) GENOTYPES FOR HOST

PLANT RESISTANCE TO ASCOCHYTA BLIGHT (*Ascochyta rabiei*) IN

ELGEYO-MARAKWET, UASIN-GISHU AND BARINGO COUNTIES OF KENYA

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In Kenya, the counties of Elgeyo-Marakwet, Uasin-Gishu and Baringo, where maize, wheat and barley are normally grown, can be used to produce a second crop during the off-season (October-February) before the next cropping season or as a rotation crop during the main season (April-August). Introduction of drought tolerant leguminous crops such as chickpea in these counties is ideal in order to provide an alternative source of income to farmers. However Ascochyta blight (AB) disease which causes a lot of yield loss in chickpea could hinder this effort. Although the disease can be controlled by application of fungicides, host plant resistance is the most ideal as it is cheaper and ecologically sustainable. The objectives of this study were; to determine Ascochyta blight disease incidence and severity levels among selected chickpea genotypes in Elgeyo-Marakwet, Uasin-Gishu and Baringo counties, to determine the effect of Ascochyta blight disease on grain yields of selected chickpea genotypes in the three counties and to determine resistance levels to Ascochyta blight disease among selected chickpea genotypes. The study was carried out in three field sites; at Eldoret (LH4) in Uasin-Gishu county, Kaptagat (UH4) in Elgeyo-Marakwet county and ATC-Koibatek (UM4) in Baringo county. Greenhouse screening was carried out at Egerton University. Twenty five genotypes were obtained from Egerton University’s Seed Unit for evaluation in the three field sites and in the greenhouse. In the field, each genotype was sown in 2 m × 2 m plots, while in the greenhouse the genotypes were sown in 2 kg plastic containers. Each experiment was replicated 3 times in a randomized complete block design (RCBD). Data on disease incidence, severity and resistance levels to Ascochyta blight disease was obtained. Also data on grain yield and yield loss due to Ascochyta blight disease together with yield components such as plant height, number of pods, hundred seed weight, biomass and days to physiological maturity were collected. Collected data was subjected to Analysis of Variance (ANOVA) using PROC GLM of the SAS software. Correlation analysis was done using the PROC CORR procedures of the SAS (Version 9.3) and means were separated using Duncan’s Multiple Range Test (DMRT) at α = 0.05. There was very high (> 85 %) Ascochyta blight disease incidence in the three field experimental sites. Analysis of variance showed significant difference (P ≤ 0.0001) in resistance levels among the test genotypes; with mean resistance level of 5.68, coefficient of variation C.V = 12.55 and $R^2 = 0.88$. There was a
negative correlation ($r = -0.84$) between resistance levels of the test genotypes and their grain yield performance. Yield performance had a positive correlation with yield parameters such as number of pods ($r = 0.85$), biomass ($r = 0.51$) and hundred seed weight ($r = 0.39$), and a negative correlation with plant height ($r = -0.09$). Genotypes ICCV92318, ICCV07308, ICCV07304, ICCV00302 and ICCV6571 found to be both high yielding and moderately resistant to Ascochyta blight disease, are recommended for adoption in the three counties. Genotype ICCV05315 which was moderately resistant but low yielding is recommended for further breeding aimed at improving its yield. Similarly genotypes ICCV 96329, ICCV92944 and ICCV93954 which were high yielding but more susceptible to Ascochyta blight disease are recommended for further breeding aimed at improving their resistance.

**RHIZOBIA INOCULANTS COMBINED WITH ORGANIC AND INORGANIC FERTILIZER AMENDMENTS EFFECTS ON NITROGEN FIXATION AND YIELDS OF BEANS IN SOUTH KIVU, DEMOCRATIC REPUBLIC OF CONGO**

Noel Mulinganya – M.Sc

**Department: Agricultural Resource Management**

**Supervisors:** Dr. Jayne Njeri Mugwe, Dr. Felix Kipchirchir Ngetich, Dr. Frederick Baijukya

In South Kivu Eastern of DR.Congo, most soils are highly weathered, leached and have low nutrients content resulting to low agricultural productivity. The objectives of the study was (i) to evaluate the effect of combining rhizobia inoculation and different fertilizer amendment on biomass and grain yields, (ii) to assess the nitrogen fixation efficacy of commercial rhizobia strains and (iii) to assess the effect of combining rhizobia inoculation and different fertilizer amendments on soil biochemical properties. The study sites were Lwiro in Kabare District and Kamanyola in Walungu District, located in South Kivu province, Eastern DR.Congo, respectively. The experimental design was a randomized complete block design with Rhizobia as a main factor and fertilizer amendment type as a subfactor. Rhizobia strains was applied at three levels; (i) without rhizobia, (ii) with CIAT 899 strains and (iii) with USDA 2667. Fertilizers amendments was a sub factor applied at 6 levels (none, manure, full TSP, TSP split; full NPK and NPK split). At planting the plots with full dose received N, P, and K at a rate of 30 kg ha$^{-1}$, 30 kg ha$^{-1}$ and 25 kg ha$^{-1}$ respectively and half of the rate for plots with split dose (i.e. 15 kg ha$^{-1}$, 15 Kg ha$^{-1}$ and 12.5 Kg ha$^{-1}$ respectively for N, P, and K) and same amount of fertilizer top dressed just before flowering stage. The test crops were biofortified bush and climbing beans; CODMLB001 and MAC 44 varieties with three replications. Data were subjected to
Analysis of Variance (ANOVA) using GENSTAT Version 14. Treatment differences were examined using Least Significant Differences (LSD) Test at P=0.05. Results showed that CIAT 899 rhizobium strain showed high competitiveness up to 259.3% of symbiotic effectiveness. Treatments with full rates of NPK and manure were the best interactions with rhizobia leading to significant (P=0.05) an increase in soil pH, organic carbon, total nitrogen and available phosphorus by the end of the experimental period. The same treatments led to significant (P=0.05) increase in biomass yields (5.3 Mg ha⁻¹ and 7.6 Mg ha⁻¹, respectively), nitrogen fixation (38.5 and 37%, respectively) and grain yield (2.9 and 4.2 Mg ha⁻¹) respectively for bush and climbing varieties. Combination of Rhizobia inoculants with different fertilizer amendments increased the nutrient status of the soil and equally enhanced the nitrogen fixation ability of the legumes. Based on the findings, combining Rhizobia strains with full dose of N, P, and K at planting and/or with manure was recommended for a sustainable legume production and soil fertility management at both Lwiro and Kamanyola.

SOCIOC-ECONOMIC IMPACTS OF SUGARCANE FARMING ON LIVELIHOODS AND THE BIOPHYSICAL ENVIRONMENT IN TRANSMARA SUB-COUNTY, KENYA.

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Sugarcane farming has been practiced the world over since the Persian farmers discovered the “reeds that produced honey without bees” between the 6th and 4th Centuries in India. Since then, sugarcane farming has been practiced in various tropical regions of the world with the major driver of the industry being the world’s increasing demand for sugar. This has led to the expansion of arable land under sugarcane cultivation, with a myriad of problems presenting themselves ecologically, socially and economically. This descriptive survey was carried out in 2012-2014 to assess the effects of sugarcane farming on community livelihoods in Transmara sub-county, Kenya. A sample size of 384 farmers was randomly selected from an accessible population of 850, 920 people. Data was analysed using standard descriptive statistics. The study found that sugarcane farming has greatly enhanced household livelihoods through more access to income. Farmers now obtain Kshs. 37,554 from a tonne of sugarcane every six months as opposed to a mean of Ksh. 3,500 per hectare from leasing maize farms. Unlike other sugarcane belts, shift to sugarcane farming has not undermined food security in Transmara. Up to 95% of the respondents indicated having enough food from their farms (maize, bananas and indigenous vegetables) to feed their households all year round. Only 15% of the population interviewed has committed their entire arable land to sugarcane farming while 77% lease land for sugarcane while growing food crops on their individual farms. As expected, 62% of the respondents indicated that sugarcane farming has contributed to reduction in forest cover by about 12% during the last 18 years. Reduction in grazing fields also means that free range livestock farming has to change to space intensive systems like zero-grazing. Respondents also indicated that expansion in sugarcane fields has interfered with migratory corridors thus escalating human-wildlife conflicts. The cat family now hides in sugarcane plantations. Snake bites too, have increased. The contracts signed between farmers and the millers give more leeway to the millers who singly benefits from sugarcane by-products (i.e. bagasse, molasses and filter mud) while farmers only obtain the price of raw sugarcane per tonnage. In retrospect, 97% of the farmers who were introduced to sugarcane farming by either South Nyanza Sugar Company or Transmara Sugar Company Limited were made aware of what it would mean to them. Millers extend extension services and credit facilities to sugarcane farmers in line with contract arming principles. From a corporate social responsibility perspective millers invest in community water projects. None of the key natural resources in the study area are gazetted, hence the need to intensify integrated community-based conservation strategies such as issuing of tree seedlings alongside sugarcane by the millers. There is need to liberalize the sugar industry to allow farmers to be flexible against the constant price fluctuations that result in net losses. Millers should also advocate for practices that allow for environmental conservation as sugarcane can only be intercropped in the early stages before canopy formation and moreover, utilizes up to 50% of soil nutrients. The farmers’ practice of maintaining sufficient for food crops should be encouraged and supported with appropriate extension.
Root-knot nematodes (RKN) (*Meloidogyne* spp.) cause up to 80% yield losses in infected vegetables. A study was carried out to; assess the influence of farmers’ knowledge and awareness on RKN damage on African nightshades (AFNS); assess the incidence and severity of RKN on AFNS; characterize the RKN species infecting AFNS; screen the AFNS for response to RKN and determine the efficacy of solarizing soils amended with selected organic materials against RKN. A root-knot nematode survey was carried out in selected farms in Lower midlands 1 (LM1), Upper midlands 1 (UM1), UM2, UM3 and UM4 located in Nandi, Bungoma, Kakamega and Uasin Gishu Counties during the April to July 2014 growing season. The survey revealed that 53.6% of the AFNS farmers were not aware of RKN. Majority (66.7%) of the farmers planted AFNS using organic manure while 33.3% used inorganic fertilizers. Farmers controlled RKN through the use of pesticides, crop rotation, woodash and uprooting diseased crops. Two hundred and fifty soil and root samples were taken from depths of 20 cm from ten different points per farm to determine the disease incidence and severity. Incidence and severity of 94.13% and 2.63 respectively was reported. Galling index ranging from 1.3 to 4.43 was reported. Molecular characterization identified *M. incognita*, *M. arenaria*, *M. hapla*, *M. javanica* and *M. lopezi* from the surveyed areas. The response of AFNS to RKN varied from resistant to susceptible. *Solanum eldoretianum* and *S. scabrum* were resistant, while *S. sarrarachoides* was tolerant in the greenhouse and field conditions. *Solanum americanum* and *S. nigrum* line IP03 were resistant in the greenhouse, but were tolerant to RKN in both field experiments, while *S. nigrum* landrace from Kakamega and *S. opacum* were resistant in the greenhouse and field test at Kenyatta University but were tolerant to RKN at Chepterwai. Both *S. nigrum* from Simlaw Seed Company and *S. villosum* line BG03 were susceptible in the field test at Chepterwai though they were tolerant in the field test at Kenyatta University. In addition, resistant and tolerant AFNS had lower RKN damage and reproduction compared to susceptible AFNS. Solarized soils amended with Cattle manure (Cm), *Tithonia diversifolia* (Td) and pymarc (Pm) reduced RKN population and damage significantly compared with non-solarized and non-amended controls. Solarization improved efficacy of Cm, Td and Pm against RKN reproduction and damage on *S. villosum*. Reproduction was lower on Cm, Pm and Td amended soils while galling index ranged from 0.7 to 2.2 in solarized soils compared to 1.4 – 5.0 in non-solarized soils. Sensitization of farmers on RKN damage and application of organic amendments to reduce disease incidence and severity is
proposed. The dominant RKN identified threatens AFNS production in the surveyed regions. Farmers should grow tolerant AFNS on heavily infested soils to reduce RKN population and reproduction. The tolerant AFNS could also be used in breeding programs for the management of RKN. Solarizing soils amended with organic materials is an ideal integrated pest management strategy for combating RKN infecting AFNS.

SCHOOL OF ENVIRONMENTAL STUDIES

Masters

INTEGRATING SUSTAINABLE ENVIRONMENTAL PRACTICES IN COMMUNITY BASED MICROFINANCE ORGANIZATIONS IN KIAMBU COUNTY, KENYA

MBWIRIA LUCY MUTHONI – M.Env

Department of Environmental Studies and Community Development

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This study focuses on integration of sustainable environmental practices into the activities supported by the Community-Based Microfinance Organizations (CBMFOs) which are vibrant in Kiambu County. The objectives of the study were the examination of the socio-economic and environmental activities carried out by CBMFOs and their related problems. Assessment of the main environmental intervention programs being implemented. Consequently, appropriate means and a model of integrating sustainable environmental programs in the activities supported by CBMFOs. A total of 155 respondents participated in the field research. These were sampled from the rural sub-locations of Ruiru, namely, Mugutha, Gitothua and Mukuyu. Random, purposive and systematic sampling techniques were used to identify respondents from the target population. Key informant interviews, Focus Group Discussions (FGDs), transect walks, village resource maps, photographs and video tapes were used in primary data collection. In addition, secondary data was obtained from university libraries, Kenya National Bureau of Statistics (KNBS) and government departments. Data was cleaned, coded and summarized from each group of informants and analyzed using descriptive statistical approaches. Research findings indicated that the CBMFOs mostly engaged Merry-Go-Rounds as a form of social activity. The
main economic activities supported by CBMFOs were crop and animal production with the least being wage labour. The social and economic problems included exclusion of those perceived as unsocial and limited resources. Land degradation was the main environmental challenge. The study found out that the organization of community microfinance lacked an environmental objective within its mandate. Environmental conservation activities were minimal and limited to individual members. In jeopardy were the sustainability of the farm activities and the capability of members to repay the loans. Integration of sustainable environmental practices into activities supported by CBMFOs is necessary for sustainability of natural resources. Capacity building of members of CBMFOs is paramount through training and funding on sustainable agricultural practices and development of environmental-friendly income generating activities. To provide the interface in addressing environmental concerns, the institution ought to link delivery of financial services to adaptation of environmentally constructive practices.

IMPACT OF CLIMATE VARIABILITY ON SELECTED KIPSIGIS SACRED PLANT SPECIES IN BELGUT DIVISION, KERICHO COUNTY, KENYA

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Indigenous plant species have salient socio-cultural significance among many peoples of Africa. In Kenya, certain plant species are important for ceremonial functions such as marriage and rites of passage. Among the Kalenjin, over 100 species are important for such functions. However, the species are relatively under threat in their occurrence and abundance due to climate variations and impacts of development. The purpose of this study was to examine the impact of climate change on the occurrence and abundance of three selected plant species namely \( \text{Croton macrostachyus} \) Hochst. ex Delile, 1847, \( \text{Periploca linearifolia} \) Linnaeus, 1753 and \( \text{Vernonia auriculifera} \) Linnaeus, 1847. \( \text{Croton macrostachyus} \); that are culturally significant among the Kipsigis of Belgut Division in Kericho County. The selected plants were commonly used to construct a prayer altar “mabwaita”. Specifically the study intended to relate climate variability to the culturally-important tree species’ occurrence and abundance. Three hundred and ninety five households were randomly selected from rural farms in Belgut Division, Kabiangla location. Questionnaires were administered to the heads of the households about the perceived impacts of climate variability on the plant species. The questionnaires included the Likert type scale on
which the respondents expressed their beliefs about species occurrence and abundance in relation to climate variability. Focused group discussions on the occurrence and abundance of the species were held with key informants from the area, visual assessment of the land cover of the selected plant species were also made to estimate the species occurrence and abundance. Other relevant information was obtained from secondary sources such as that of rainfall and temperature data from 1980 to 2012 was obtained from Kericho meteorological department. The data obtained was statistically analyzed by use of SPSS and results discussed and presented in tables, charts and graphs. Respondents who reported that rainfall and temperature patterns have varied significantly over time represents 92.7% while those that responded that there has not been any change represents 7.3%. The difference between the two categories of respondents was significant ($\chi^2=218.5$, $p=0.000$). The responses were tested by adopting statistical significance of $p \leq 0.05$.

From the study it was found that rainfall and temperature variability have affected the three sacred plant species under study, but the most affected of all is *P. linearifolia* followed by *V. auriculifera* and the least affected is *C. macrostachyus*. However apart from climate variability human activities have also affected the plants occurrence and abundance. Recommendation made for further study include; Farmers to practice agroforestry (growing of trees alongside crops). Farmers should also establish forests within their farms. This will increase evapotranspiration and create more carbon sinks hence maintaining an ideal temperature and rainfall for vegetation. The community should be encouraged to domesticate the plants, especially *P. linearifolia*. Riparian strip should be left undisturbed to allow natural vegetation to grow. These will include *C. macrostachyus*, *V. auriculifera* and *P. linearifolia* and others. Exotic trees (i.e. *eucalyptus ssp*) along the riparian strip should be cut down. Farming along the strip should also be discouraged. Researchers to find out ways in which occurrence and abundance of *C. macrostachyus*, *V. auriculifera* and *P. linearifolia* can be enhanced.

ATTITUDES INFLUENCING ADOPTION OF BIOGAS FUEL AMONG WORKERS AND LEARNERS IN SELECTED CHRISTIAN BASED TRAINING INSTITUTIONS IN NANDI COUNTY, KENYA

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Over-dependence on unsustainable wood fuel and other forms of biomass energy as the primary source of fuel to meet household energy needs has contributed to environmental drawbacks. Adoption of biogas as alternative source of energy has many advantages including conserving trees, being cheap and clean. Biomass energy contributes 68% of the national energy requirements and is expected to remain the main source of energy in the foreseeable future. The main purpose of the study was to assess attitudes influencing adoption of biogas fuel among
workers and learners in selected Christian based training institutions in Nandi County. The specific objectives of the study were to compare the attitude of adopters and non-adopters of biogas towards adoption and utilization of the fuel as a source of sustainable energy in the training institutions, to determine factors influencing adoption and use of biogas fuel, and to establish the level of awareness and utilities of biogas fuel in the training institutions. The population of this study was made up of twelve tertiary institutions of middle level college. The sample comprised workers and learners of the two training institutions both located at Kapsabet town. Purposive sample selection (Census sampling) and descriptive case study research design were involved where 318 respondents participated in the study. The respondents were students, nonteaching staff, tutors and head teachers of the selected Christian based training institutions. A structured questionnaire was administered to obtain data on respondents’ attitudes as well as opinion on adoption and use of biogas fuel as alternative source of energy. Data were statistically analyzed using SPSS version 20 and results presented in tables, graphs and charts. This research assessed the attitude of respondents including learners, cooks, tutors and head teachers of Christian Intermediate Technology Centre and St. Paul’s Theology College in Nandi County as well as factors that influences adoption of biogas fuel as alternative source of energy. Results show that a significant proportion of all respondents have not used or adopted biogas energy; tutors ($\chi^2 = 22.091$, df = 1, n = 33, p-value = 0.000), non-teaching staff ($\chi^2 = 5.261$, df = 1, n = 23, p-value = 0.022) and students ($\chi^2 = 100.8$, df = 1, n = 260, p-value = 0.000). Results also show that a significant proportion of the respondents (96.0%) had a negative attitude towards use of biogas fuel. In addition, there was significant difference in respondents’ attitude towards biogas fuel adoption ($\chi^2 = 10.667$, df = 1, p = 0.001). Further, the study results revealed that several factors including conservation of environment, being a clean energy and need for small space for installation influenced adoption of biogas fuel. In addition, there is availability of the common raw materials including animal, agricultural, human and kitchen waste. The findings of the study will be important to policy makers to turn around attitude towards biogas fuel use as alternative source of energy and save the environment.

DETERMINATION OF NEONICOTINOID RESIDUES IN HIVE PRODUCTS FROM KIAMBU AND NAIROBI COUNTIES, KENYA

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Information on pesticide residue occurrence in hive products is scanty or lacking yet it is important so as to safeguard human health from effects of pesticides. The aim of the study was to identify and quantify neonicotinoid residues in hive products. The study was undertaken for 6 months between (March-August, 2015) at Kiambu and Nairobi Counties. The objectives of the study were to find out
the pesticides used in the cultivation of crops, the frequency of use and the concentration of neonicotinoids in honey and bee bread (pollen). The methodology used was a structured questionnaire which was used to find out the pesticides used and frequency of their application. A modified Quick Easy Cheap Rugged Safe (QuEChERS) and liquid chromatography tandem mass spectrometry (LC-MS/MS) were used to determine the presence and concentration of neonicotinoids. The Chi-square was used to test frequency of pesticide application on cultivated crops around the apiaries and T-test was used to perform a comparison between concentration of residues detected in honey, pollen and in different landscape structures as well as making comparisons with European Union Maximum Residue Limits (EU-MRL). The study results indicated commonly used pesticides are carbamates (32.4%), pyrethroids (14.6%), neonicotinoids (14.4%), herbicides (15.7%), fungicides (1.4%), acaricides (5.6%) and organophosphates (14.5%). Further, 26.4% of respondents used carbaryl carbamates, 13.2% use Karate, 12% thiamethoxam and 7.4% dichlorvos. Regarding frequency of application, 86% of respondents used the pesticides once every week, 12.5% fortnightly and 1.4% when available. Chi-square test showed no significant difference in the application frequency (p>0.05). Honey was contaminated with acetamiprid with the mean levels of 0.41μg/kg. Thiamethoxam concentration in honey ranged from undetectable to 47.8μg/kg in Thika IPM with mean of 19.81μg/kg and standard deviation 24.77. Concentration of acetamiprid compound ranged from 0.1 ppb in Lari, Gatundu, Ruiru, Thika, Kikuyu, Karura and Ngong forests to 0.5 ppb in Thika IPM. The mean levels of neonicotinoid concentration in honey were found to be statistically significant when compared with EU maximum residue limits (50 ppb) established for food products (p<=0.05). The results generally showed low levels of neonicotinoid insecticides in bee food across Kiambu and Nairobi County. There was significant differences in neonicotinoid concentrations between cultivated and forested landscapes (p=0.009) and also when compared with EU-MRL in food substances (p=0.001). On average, there were higher concentrations of neonicotinoids in hive products from apiaries in cultivated areas compared to forested areas. Pesticides were detected in honey at remarkably low levels, ranging from 0.32 - 0.50 parts per billion (ppb), except for thiamethoxam, which measured 47.80 ppb in pollen. Based on the study results, honey from the studied areas is safe for human consumption and the honey bees are not exposed to harmful levels of neonicotinoids. However, pesticides persist in the environment and their levels should be monitored regularly. Beekeepers in the study areas are therefore advised to use the agro-ecological approach in applying the pesticides.

EFFECTS OF TRENDS OF CLIMATE VARIABILITY AND SMALL-SCALE FARMERS’ PERCEPTION AND ADAPTATION STRATEGIES IN KIJABE LOCATION, KIAMBU COUNTY, KENYA

BY

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This study was undertaken in Kijabe location where small-scale farmers depend on rain fed agriculture and over the years, frequent crop failure due to rain shortages has become common. Climate scientists predict increasingly dry conditions in much of Africa due to climate variability. Small-scale farmers’ efforts to adapt have shown both unfavourable and positive effects and hence the need to be explored. This study therefore examined the small-scale farmers’ adaptation strategies to climate variability, in Kijabe location, Kiambu County, Kenya. The study evaluated trends in rainfall and temperature between 1983 and 2013, assessed how these trends of climate variability have affected farmers’ perception in climate variability and also explored small-scale farmers’ adaptation strategies. The study further analysed how socioeconomic factors influence small-scale farmers’ adaptation to climate variability in Kijabe. Mixed method approach was adopted in addressing the objectives of the study. The study employed simple random and purposive sampling techniques. Questionnaires, interviews, field observations and review of documents, techniques and tools were employed to generate relevant data. Qualitative and quantitative data analysis techniques were adopted and results presented using frequency tables, bar graphs and pie charts. Results of the study established that small scale farmers in Kijabe experienced climate variability in the period 1983-2013. The results of this study established a positive relationship between temperature variation and adaptation by small scale farmers in Kijabe. Small scale farmers who detected an increase in temperature were more likely to adapt compared to those who have not detected any increase in temperature \( (r = 0.015, p<0.020) \). The study further showed that small scale farmers who detected an increase in rainfall were less likely to adapt compared to those farmers who detected a decreased in precipitation \( (r = -0.014, p<0.001) \).

Major adaptation methods adopted by small scale farmers were mixed crops farming (91%), growing crops that mature faster (90%), increased use of inorganic fertilizers (87%) and change of planting dates (i.e. planting at first rain) (74%). The probability of more educated farmers to adapt to climate variability was higher than that of less educated farmers \( (r = 0.010, p<0.01) \). The challenges to climate adaptations strategies among the small scale farmers identified included; lack of improved seeds (87%), lack of capital (86%), lack of necessary farm inputs (77%), lack of information about proper adaptation mechanisms (69%), lack of timely climate forecasting information on the expected climate changes (53%) and shortage of water for irrigation (52%).

The study concluded that climate variability is real and small-scale farmers have adopted various adaptation strategies which are constrained by a range of challenges in Kijabe. The study recommends that rain-fed farming in Kijabe needs to be complimented with drip irrigation, rain water harvesting and green house techniques to enhance sustainable crop production. Ministry of Agriculture and Kenya Meteorological Department should ensure accurate, reliable and customized weather information is recorded and weather advisories are timely developed and availed to the farmers. Small scale farmers should be empowered on the need to embrace sustainable adaptation strategies.
In Kenya, the transition from National to County level energy planning has experienced various challenges, one of them being the lack of reliable baseline data upon which such plans can be based. This is evident because the last comprehensive biomass study done by the Ministry of Energy was in 2002, which is too old for effective and efficient biomass energy planning. This study provides this data by analyzing the demand for and supply of fuelwood in secondary schools within the County of Trans-Nzoia.

Furthermore, the study highlighted the important role that the wider adoption of energy-efficient institutional stoves would play in the sustainable management and conservation of forestry resources in the County. A questionnaire survey with 65 randomly selected schools, actual weighing of the daily fuelwood consumption estimates and general site observations were carried out. From the study, the mean daily fuelwood consumption was 159.2±91.75 kg per school and 0.524 kg per student.

As it will be discussed later in the thesis, these consumption rates varied when considering the type of cookstove used and the number of students being cooked for. *Eucalyptus species, Grevelea robusta, Acacia species* and *Croton species* were the commonly harvested tree species for fuelwood, with farmlands and forests being the main areas of harvest. In these schools, parents supplied majority of the fuelwood as fees in kind. Regarding improved cookstoves adoption rates, 68% of the sampled schools had adopted the stoves. However, only 26% of these schools used them exclusively, while 42% combined them with either a traditional or semi-improved cookstove or both. On the benefits of using an improved cookstove, a typical school saved about 0.34 kg per student daily and 91.8 kg per student annually. This fuelwood saving was equivalent to a financial saving of Ksh.138 per student annually. The results present a
potential baseline data that could be used for energy planning and forest resource management purposes in Trans-Nzoia County.

THE ROLE OF LAND USE AND LAND COVER CHANGES AND GIS IN FLOOD RISK MAPPING IN KILIFI COUNTY, KENYA

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An increase in the size of population leads to changes in land use and land cover as the growing community seeks more land for agriculture, settlements and infrastructural development. Land use and land cover change (LULCC) alter natural drainage systems, impact on surface runoff and affects infiltration capacities of an area; factors which contribute to flooding. Management of floods begins by mapping flood prone areas and understanding the vulnerability factors. The main objective of this study was to identify areas in Kilifi County that are vulnerable to flooding and to assess the cause of floods using GIS - based flood risk mapping. The specific objectives were to determine the extent and nature of land use and land cover changes occurring in Kilifi County in the period between 1990 and 2014; to establish the effects of land use and land cover change on surface runoff and infiltration capacities and to generate a flood risk map for Kilifi County. Landsat images for 1990, 2000 and 2014 were used to classify the area into forestlands, grasslands, croplands, settlements, wetlands and shrublands. The mapped data from satellite images of 1990 indicated a forest cover of 1042.9km², a 26.3km² cover for settlements and a 5142.0km² cover for croplands. In 2000 there was a forest cover of 940.4km², 27.8km² for settlements and 4693.0 km² for croplands. In 2014, there was 825.8km², 46.5 km² and 5123.8km² cover for forestlands, settlements and croplands respectively. Between 1990 and 2014, forest cover reduced by 580.3Km², croplands increased by 1170 Km² to cover 49.9%, while settlements increased by 93.3Km² to 0.9% of the total area respectively. These changes alter surface runoff, river discharge and affect soil infiltration capacities. Infiltration experiments conducted in the different land cover classes using a Double Ring Infiltrometer established that infiltration rates were highest in the sandy soils and lowest in the clay soils. It took an average of 5.5min and 29min for water to percolate into loamy soils in the forestlands and settlements respectively; an average of 30min and 21min for infiltration under clay soils in...
the grasslands and shrublands respectively, while under sandy soils; it took 21.5min for infiltration in the settlement areas. Analysis of trends in stream flow data for Sabaki River available for the period between 1990 and 2012 indicated a change in the river discharge over this period albeit not significant. This data did not adequately cover the study period but covered 95% of the period between 2001 and 2012. Different thematic maps on land use and land cover, slope, rainfall, soil and drainage were generated. Different weightage values were assigned depending on their importance to flood risk and overlaid in the spatial analyst tool in ArcGIS 10.1 to generate a flood risk map. A flood risk map was developed identifying five categories of risk zones; the very high, high, moderate, low and very low risk zones. At 54.9%, Kilifi County generally has a high risk of flooding. The low risk areas cover only 1.1% of the total area. Zoning of flood risk areas is important for planning development in the area. The document provides base information for the national government, county governments, NGOs and the community on flood risk areas in order to intervene during flood preparedness, response, mitigation and recovery processes respectively.

DETERMINANTS OF STUDENTS’ UPTAKE OF REPRODUCTIVE HEALTH SERVICES TARGETING HIGH RISK SEXUAL BEHAVIOR IN KENYATTA UNIVERSITY, NAIROBI COUNTY, KENYA

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High risk sexual behavior and its consequences among university students’ continues to be a serious concern for learning institutions, parents, researchers and policy makers. This concern
has been marked by the increased number of reproductive health interventions worldwide aimed at ensuring young adults have access to reproductive health information and services. In Kenya, a number of Universities have developed policies and set up programs to curb student high risk sexual behavior. However, this has not resulted in a decrease in high risk sexual behavior among students. In addition there is paucity of literature on studies assessing students’ uptake of reproductive health interventions in Kenyan universities. The purpose of the study was to assess students’ knowledge, attitude and practices relating to uptake of reproductive health services in Kenyatta University. The objectives of the study were to; establish students awareness of existing programs and services that address reproductive health issues at Kenyatta University; to determine influence of social demographic characteristics on students uptake of available reproductive health services; to determine students knowledge on high risk sexual behavior and in relation to their uptake of reproductive health services; to determine students attitude affecting their uptake of reproductive health services; to identify students high risk sexual behavior practices that influence uptake of reproductive health services and analyze relationships between students socio-demographic factors, knowledge, attitude and practices influencing uptake of reproductive health services. The study was guided by the Health belief model. The study employed a cross sectional survey research design. The sample size was comprised of 178 students who were selected using random sampling. Data was collected using a structured questionnaire for students’ and interview guide for the key informants. Qualitative data was analyzed using content analysis while quantitative data was analyzed by use of SPSS using both descriptive and inferential statistics. Research findings showed that 44.4% of the students’ had utilized the available reproductive health services in Kenyatta University. Chi square results revealed significant relationships between uptake of reproductive health services and students attitude to abstinence till marriage (p=0.014), attitude in condom use (p=0.005), maintenance of confidentiality (p=0.001), friendly service providers (p=0.000) students engagement in inconsistent condom use (p=0.012), multiple sexual partners (p=0.028) Sex under influence of alcohol (p=0.002) and sex for favor (p=0.022). The study concluded that students’ engagement in high risk sexual behavior and their attitude towards service provision influenced uptake of reproductive health services whereas students’ social demographic characteristics and their awareness of high risk sexual behavior practices did not influence uptake of reproductive health services. The study recommends reengineering of the way students are sensitized of about reproductive health services. Such strategies would include: use of social networks, increasing number of student peer counselors and provision of information on available reproductive health services during students’ admission. It is envisaged that these strategies will increase students’ awareness and uptake of reproductive health services.
Climate change is viewed as one of the greatest challenges facing humanity manifested in form of variation in amount and distribution of precipitation, ocean salinity, wind patterns and aspects of extreme weather leading to droughts and flooding, among others. These changes threaten community livelihoods, economy, ecosystems and social cohesion. Africa is particularly viewed to bear the brunt of the climate change threats mainly due to its poor economic development and low institutional capacity. Vulnerable communities within the continent are facing the highest pressure. Among the conspicuous threats are decline in crop production, livestock deaths due to droughts, malnutrition, resource based conflicts and migration. Pastoral community in Maikona location (Marsabit County) is one such community. The existence of effective coping mechanisms is vital for the survival of these communities. This exploratory study sought to investigate the coping mechanisms that pastoral communities have employed in Maikona Location and their sustainability. The study employed both quantitative and qualitative methods, targeting 145 respondents including 127 Households respondents, 14 Youth and Women group members in FGDs and 4 technical/NGO representatives. Questionnaires, FGDs and key informant checklists were used as the main tools. Data were analyzed both descriptively and inferentially. It is envisioned that the study would give vital information to pastoral development stakeholders and policy makers on the actual impacts facing the pastoralists, the existing and appropriate coping mechanisms while guiding on the interventions and policy options. The study found out that there had been real and perceived changes both in the rainfall and temperature patterns. Field inquiries indicated a great change in rainfall patterns (94%) between 1980 and 2010 as well as a significant trend of decline from the data of the metrological department. These changes were established to be negatively impacting livestock production and the livelihood of
the community in the study area. The local community was found seeking for relief food, buying food on credit and selling livestock asset as the common coping strategies. However, the sustainability of those strategies is in huge doubt since most of the respondents were not even sure of their longevity while others admitted they may not use them for long. Moreover, majority (84%) of the respondents could not tell the consequence of their strategies on the environment. The external supports provided to the communities were largely in response to emergencies and were not seen as sustainable in the long term. The study recommended that the metrological department should share rainfall data constantly with the pastoralists for them to understand the dynamics of rainfall and temperature variations on livestock production and possible coping strategies customized for their situation as well as advise them on sustainability. The study further recommended the need for a long-term support like establishment of livestock market, support to education through sponsorship and adopting policies that support mobility as opposed to sedentarization of the communities.

Ph.D

IMPACTS OF INCREASED HUMAN SETTLEMENT IN KITENGELE WILDLIFE DISPERSAL AREA ON THE MIGRATORY WILDLIFE OF NAIROBI NATIONAL PARK, KENYA

John Kamau M. Wandaka – Ph.D

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Dr. Paul T. Obade

Nairobi National Park, which was established in 1946, to conserve the abundance and diversity of wildlife in the Kitengela-Athi-Kaputei plains, from excessive exploitation, is currently fenced except on the Kitengela side across the Mbagathi River. The subdivision of the group ranches, which commenced in the 1980s, limits access of wildlife to the migratory corridor, and dispersal
areas. The study, therefore aimed at investigating the impacts of increased human settlement in the Kitengela dispersal area, on the migratory fauna of Nairobi National Park, and to identify appropriate mitigation measures. The data was collected between May 2012 and August 2013; primary data gathering was staggered to cover both the dry season and the wet season. Secondary data was gathered from published literature; satellite images and Geographical Information Systems, were used to indicate changes in the study area over the last three decades. The data collected was analysed using descriptive and inferential statistics, Analysis of Variance, regression analysis, the Statistical Package for Social Scientists, and excel computer packages. The findings indicated that increased human settlement in the study area resulted into multiple negative impacts on the migratory wildlife of Nairobi National Park, mainly due to loss of dispersal area and blockage of migratory routes, leading to wildlife confinement, decreased wildlife tolerance and increased incidences of human wildlife conflicts. Data analysis indicated decline in migratory wildlife population thus negative effect ($F= 6.066, p<0.05$). Immigration into Kitengela area was considered by 74% of the local community as a major factor affecting increase in human population, however the regression analysis structural model fitted indicated ($p<0.05, F= 0.921, R=0.295, R^2= 0.087$) that business ventures ($\beta = 0.954$) has high correlation with the decline in migratory wildlife. The findings also indicated that loss of migratory routes/dispersal area and reduced vegetation cover was regarded by 55% of the local community as main consequence of the subdivision of the group ranches leading to decreased wildlife tolerance ($\beta = 0.246$) and wildlife confinement ($\beta = 0.371$) in Nairobi National Park ($p= 0.021, < 0.05, F= 2.678; R=0.179, R^2= 0.032$). The results also indicated that killing of wildlife ($\beta = 0.199$) has the strongest impact on decline in population of migratory wildlife followed by human settlement ($\beta = 0.082$), and lack of pasture ($\beta =0.081, F= 1.778, df=9; p = 0.031. R=0.196,$
R2= 0.038). The study identified mitigation measures for the long time sustainability of the park, the dispersal area and migratory corridor, including holistic implementation of the Kitengela Land Use Management Plan, mapping and protection of the vital wildlife areas within the migratory range, including the wildebeest calving area in North Kaputiei. The findings will be of vital importance, not only in the management of the Kitengela Conservation Area, and migratory corridors in the Arid and Semi-Arid Lands, but also other rangelands in Africa faced with similar challenges.

**IMPACTS OF INCREASED HUMAN SETTLEMENT IN KITENGELE WILDLIFE DISPERSAL AREA ON THE MIGRATORY WILDLIFE OF NAIROBI NATIONAL PARK, KENYA**

John Kamau M. Wandaka – Ph.D

**Department: Environmental Sciences**
**Supervisors: Prof. Steven G. Njuguna Dr. Paul T. Obade**

Nairobi National Park, which was established in 1946, to conserve the abundance and diversity of wildlife in the Kitengela-Athi-Kaputiei plains, from excessive exploitation, is currently fenced except on the Kitengela side across the Mbagathi River. The subdivision of the group ranches, which commenced in the 1980s, limits access of wildlife to the migratory corridor, and dispersal areas. The study, therefore aimed at investigating the impacts of increased human settlement in the Kitengela dispersal area, on the migratory fauna of Nairobi National Park, and to identify appropriate mitigation measures. The data was collected between May 2012 and August 2013; primary data gathering was staggered to cover both the dry season and the wet season. Secondary data was gathered from published literature; satellite images and Geographical Information Systems, were used to indicate changes in the study area over the last three decades. The data collected was analysed using descriptive and inferential statistics, Analysis of Variance, regression analysis, the Statistical Package for Social Scientists, and excel computer packages. The findings indicated that increased human settlement in the study area resulted into multiple negative impacts on the migratory wildlife of Nairobi National Park, mainly due to loss of dispersal area and blockage of migratory routes, leading to wildlife confinement, decreased wildlife tolerance and increased incidences of human wildlife conflicts. Data analysis indicated
Motivation and its impact on workers’ productivity in construction firms in Lagos, Nigeria

Afuye, Funso – Ph.D

Department: Environmental Planning and Management

Supervisors: Dr. Letema, Sammy

Dr. Munala, Gerryshom

Motivation is considered as an important tool for enhancing worker’s productivity. Construction sector is not an exception. It has been empirically established that motivation has positive impact on construction worker’s productivity. Moreover, empirical studies have shown that productivity in the sector has been decreasing globally. This study therefore aims at examining the relationship between motivation, resistance and productivity and develops a model of this relationship as a way of addressing this challenge. Quantitative research design was employed with same questionnaire to the population covered. Productivity level was measured by work study with the use of five minutes field rating. Stratified and random sampling techniques were used to administer questionnaire to the supervisors, craftsmen and contractors sampled from a
selected number of medium and large size firms in Lagos, Nigeria. Stratified sampling was used to divide supervisors into strata of builder, architect and engineer. Purposive sampling was used to administer questionnaires to various supervisors and craftsmen. 174 questionnaires were administered to supervisors collectively and 105 was filled and returned which constitute 60% success rate. 295 questionnaires were administered to craftsmen, 150 were filled and returned which constitute 50.85% success rate. 16 questionnaires were administered to contractors which makes up the firms surveyed, 12 were filled and returned which constitute 75% success rate. Questionnaire was designed in Likert scale of 1-5. Analysis was done by statistical packages for social sciences version 17. Descriptive statistics which include frequency, percentage and tables were used to present the data. One Way Analysis of Variance was used to determine whether there is variation in motivating factors influence on categories of professionals considered in the study. Linear correlation was used to test the hypothesis designed for the study. Factor analysis was used to group factors in order of potency and to also eliminate variables with low variance. This enables variables that cluster to be used to develop a model of the relationship between motivation, resistance and productivity. Multiple linear regressions were used to develop the model. It was established that: the major motivating factor of supervisors and craftsmen is financial related reward. Contractors do not relate motivation application to workers needs; there is a high positive linear relationship between motivation and productivity; the association between motivation and resistance is a weak negative relationship. The regression equation of the model of relationship between motivation, resistance and productivity is \[ Y = -1.694 + (-907)b_1 + (-425)b_2. \]

The findings also reveal that the influence of resistance among workers is not sufficient to impair on the level of productivity in construction firms in Lagos, Nigeria. The study concludes that productivity decrease being experienced in Nigeria construction industry may continue if motivation strategy is not re-designed to meet workers need.

UTILISATION OF SELECTED RAINWATER HARVESTING AND CONSERVATION TECHNOLOGIES FOR IMPROVED CROP PRODUCTION IN THARAKA SOUTH SUB-COUNTY, KENYA

FELISTA WAIHUINI NG’ANG’A – Ph.D

Department: Environmental Sciences

Supervisors: Dr. Monica Mucheru Muna

Prof. Fuchaka Waswa

Food insecurity is a major problem facing the farming communities in the semi-arid areas of Tharaka Nithi County in the Eastern part of Kenya. Recurrent drought, inter-seasonal dry spells and soil fertility challenges are key causes of food insecurity, particularly among smallholder farmers. Rainwater harvesting and conservation are important strategies towards enhanced water use and improved food production. Factors affecting utilisation of these technologies by farmers have not been well understood. Therefore this study was conducted in Tharaka South Sub-County to: i) assess the influence of household socio-economic factors on utilization of rainwater
harvesting and conservation technologies; ii) determine the relationship between knowledge levels and utilization of the rainwater harvesting technologies; iii) determine the effectiveness of varied rainwater harvesting and conservation technologies utilized by smallholder and iv) examine adaptations of smallholder farmers in coping with agricultural water scarcity in Tharaka South Sub-County. Farm and social data was collected using interviews, while yield data was collected from farmers’ fields. A total of 353 household heads were interviewed, while plots were marked on selected farmers’ fields where the selected technologies were being practiced. Data was analysed using descriptive statistics, T-test, linear regression, logistic regression, and multivariate analysis. The utilization of in situ rainwater harvesting and conservation technologies was higher (73%) for trash lines as compared to micro catchments, zai pits (26%) and negarim micro catchments (13%). Logistic regression was significant in explaining the variance in utilization of the various rainwater harvesting and conservation technologies under investigation. Socio-economic characteristics in technology utilization were important in explaining utilization of the technologies and drought coping behavior by farmers. Parameters that were positively and significantly associated with zai pit utilisation included household size (p<0.01), training in zai pits (p<0.002), while total farm size (p<0.01) and land tenure (p<0.01) showed negative co-efficients. The sources of training for more knowledge intensive technologies were mainly technical and external sources while less knowledge intensive technologies predominantly relied on informal and community based sources of knowledge. Multivariate analysis of farmer scoring of technology effectiveness showed 3 distinct groups of farmer rating behaviour with grass strips-negarim micro catchments and agroforestry as one group which was different from fanya juu-zai rating. The third distinct group of raters included trash line and stone terraces raters. The study concluded that farmer socio-economic characteristics were important factors which should be considered in future approaches to develop and disseminate rainwater harvesting and conservation technologies in Tharaka South Sub-County. The study recommends that researchers should consider farmers’ socio-economic characteristics in future efforts to develop rainwater harvesting and conservation technologies. Additionally policy makers should allocate resources to training for increased utilization of rainwater harvesting and conservation technologies
Aesthetic creativity in the manipulation of technical elements of image and sound in a film lies at the heart of storytelling in cinema. As such, it is the aim of this study to interrogate critically how the film story is exposed, advanced, and narrated by non-verbal elements of sound design, namely film score, sound effects, ambience and silence, and how that can therefore be translated into intrinsic narrative characteristics of non-verbal sounds in film. Anchored on structuralism and semiotics film theories, this study endeavoured to investigate the denotive, connotative, and functional qualities of the aural elements in the sampled films, and how the traits exhibited, contribute to telling the story. Four purposively sampled Kenyan fiction films, *Killer Necklace* by Judy Kibinge (2008), *Formula X* by Steve Ominde (2009), *From A Whisper* by Wanuri Kahiu (2009) and *Nairobi Half Life* by Tosh Gitonga (2012), were analysed on their deployment of the sounds in their narratives. The study further interrogated the salient ways in which the non-verbal sound elements advance meaning and radiate the various story points and rudiments. This study applied observation, focus group discussions, and interviews, as methods of data collection. Content analysis was then deployed to synthesize the data. The findings from the study reveal deliberate deployment of a range of forms of non-speech sounds in Kenyan films. Further the study finds that the non-verbal elements of sound under investigation play various metaphorical and assigned functions in the films that exude significations and expressions that are in congruence and consequently mirror elements of narrative like plot, character, thematic rendition, mood, and setting. This study concludes that indeed, the expressions, and symbolic representations spelled out by non-speech elements in their singularity and as part of the intricate inter-webs of the film structure, can be coded as narrative dispositions of the said elements.
CINEMATOGRAPHIC TECHNIQUES OF HILARY NGWENO’S
THE MAKING OF A NATION

FRANCIS MWANGI IRUNGU – M.A.

Department: Film and Theatre Arts

Supervisors: Dr. John Mugubi
Dr. Rachael Diang’a

Just in the same way the African history was reconstructed through such elements as archaeological sources, oral traditions among others, Hilary Ngweno’s The Making of a Nation documentary film series used the same principle to reconstruct Kenya’s political history through cinematographic elements such as archival materials (still photographs and a few video clips). The former has already become an academic discipline while the later is attracting an academic attention beginning with this study. This study sought to critically explore the various cinematographic techniques deployed in Hilary Ngweno’s The Making of a Nation documentary series. The specific focus of the study is the establishment of cinematographic styles and characteristics in Hilary Ngweno’s films. The study also examines the role of cinematographic techniques in these films. Finally, it analyses thematic and narrative development in the episodic films. The study uses formalist film theory as its apparatus in analysing the films. The film theory is concerned with design and form of shots composition. Formalist films persuade viewers to see things the way the artist sees them. The sample size is the fourteen (14) episodes of Hilary Ngweno’s documentary series. The specific focus is the examination of how the narratives have engaged formalistic tendencies and thus their efficacy and reliability on archival resources for reconstruction of Kenya’s political history. This study is qualitative research deploying the case research design. Qualitative research explores attitudes, behavior and experiences. It attempts to get an in-depth opinion from participant(s). Reading and interpretation of pictures (films) is subjective and therefore based on attitudes, behavior and experiences. The researcher watched the films and recorded down their various aspects in relation to the study objectives. This helped to identify the various cinematographic elements which is the main focus of the study. Data analysis capitalized on textual analysis to yield information relevant for film studies and policy formulation in respect to archival film techniques. The filmmaker uses especially still photograph shots to create other various shots which include extreme close ups, close ups, medium shots, zooms-in, zooms-out, among others. The close up shots dominate in all the episodes in the documentary film series and have been
used to show reactions among various political players and create emotional attachment to the viewers. They help to bring viewers closer to the subject(s) covered. The camera angles have been used to show political supremacy where political machinations and counter machinations involving political figures is also a subject of this study. The study made two recommendations; (1) recommendation for more documentary film series and (2) recommendation for further research.

Ph.D

INVENTION AND (RE) CONFIGURATION OF SPACE IN SELECTED KENYAN TELEVISION DRAMAS

CHARLES KEBAYA – Ph.D

Department: Film and Theatre Arts.

Supervisors: Dr. John Mugubi
Prof. Oluoch Obura

The study interrogates the invention and (re)configuration of space as a social construct in Kenyan television drama. While focusing on selected local television dramas; Mheshimiwa, Mother-in-law and Tabasamu, the study examines manifestations of space, and how characters contest, and (re)configure emergent spaces in the contemporary society. The first television
drama aired on Kenya Television Network (KTN) whereas the second and third air on Citizen Television. The study investigates space in the selected television dramas as an intersection and a conversation with various formations, past and present, in a bid to understand socio-cultural, economic and political realities in Kenya. The study employs the theorization of space to explore the framing and dramatization of space in local television drama. Hinged on an iterative research design, primary data was obtained from a close examination of three purposively sampled local television dramas. Purposively selected episodes of the three dramas were studied and information obtained regarding space was recorded and considered data for analysis and interpretation. Secondary sources that comprised texts, dissertations, scholarly publications and articles related to the area of study were consulted. Guided by the research objectives, primary and secondary data obtained were analysed, interpreted and collated using thematic content analysis. Limited access to the television dramas due to suspicion of being a pirate masquerading as an academic and copyright issues were key challenges that this study faced. From the analyses, it emerged that local television drama exploits spaces such as the family, court, political and the everyday space to make sense of various issues affecting society. Issues such as political leadership, material affluence, youth identity formations, social referents and sex(uality) discourses are not only figured but also contested, invented and reconfigured in society as portrayed in local television drama. It also emerged that young female professionals were depicted as challenging patriarchal practices and that to them, sexual pleasure is viewed as a desire that is related to their status as career women, but above all to possibilities generated by being relatively independent from social control. Strengthened by their financial independence, this category of women is at the vanguard in reconfiguring subjectivities and social complexities of sexuality in the contemporary Kenyan society. In this way, local television drama functions as a popular site for exploring and understanding emerging moral issues that characterize young women’s sexualities in Kenya. Consequently, the study concludes that artistic sensibilities in local television drama crystallize in the characterization of women as being in the forefront in challenging masculinity and reconfiguration of emergent practices of feminine power and agency in society.
The study interrogates the invention and (re)configuration of space as a social construct in Kenyan television drama. While focusing on selected local television dramas; Mheshimiwa, Mother-in-law and Tabasamu, the study examines manifestations of space, and how characters contest, and (re)configure emergent spaces in the contemporary society. The first television drama aired on Kenya Television Network (KTN) whereas the second and third air on Citizen Television. The study investigates space in the selected television dramas as an intersection and a conversation with various formations, past and present, in a bid to understand socio-cultural, economic and political realities in Kenya. The study employs the theorization of space to explore the framing and dramatization of space in local television drama. Hinged on an iterative research design, primary data was obtained from a close examination of three purposively sampled local television dramas. Purposively selected episodes of the three dramas were studied and information obtained regarding space was recorded and considered data for analysis and interpretation. Secondary sources that comprised texts, dissertations, scholarly publications and articles related to the area of study were consulted. Guided by the research objectives, primary and secondary data obtained were analysed, interpreted and collated using thematic content analysis. Limited access to the television dramas due to suspicion of being a pirate masquerading as an academic and copyright issues were key challenges that this study faced. From the analyses, it emerged that local television drama exploits spaces such as the family, court, political and the everyday space to make sense of various issues affecting society. Issues such as political leadership, material affluence, youth identity formations, social referents and sex(uality) discourses are not only figured but also contested, invented and reconfigured in society as portrayed in local television drama. It also emerged that young female professionals were depicted as challenging patriarchal practices and that to them, sexual pleasure is viewed as a desire that is related to their status as career women, but above all to possibilities generated by being relatively independent from social control. Strengthened by their financial independence, this category of women is at the vanguard in reconfiguring subjectivities and social complexities of sexuality in the contemporary Kenyan society. In this way, local television drama functions as a popular site for exploring and understanding emerging moral issues that characterize young women’s sexualities in Kenya. Consequently, the study concludes that artistic sensibilities in local television drama crystallize in the characterization of women as being in the forefront in challenging masculinity and reconfiguration of emergent practices of feminine power and agency in society.

USE OF PSYCHODRAMATIC ROLE-PLAYING IN HIV/AIDS COMMUNICATION AMONG THE YOUTH IN MSAMBWENI, KWALE COUNTY, KENYA

OLIVER MBAYI OMUYOMA-Ph.D.
Communication remains central in controlling and preventing the spread of HIV/AIDS because of absence of cure and vaccination against the disease. Instead of using applied theatre forms to generate dialogue and critical thinking in response to HIV/AIDS, many groups perform set plays that are not relevant to youth’s issues and needs. This study therefore explored psychodramatic role-playing in HIV/AIDS communication among the youth in Msambweni, Kwale County. Using Psychodramatic Theory of Roles, Health Belief Model and the Theory of Planned Behaviour, the study explored psychodramatic role-playing in enhancing perceptions about HIV/AIDS health threat and health behaviours. The study examined use of psychodrama in predicting a variety of outcomes including improved insights and social-awareness, social skills and therapy among the affected youth. This mixed method research adopted a case study design to explore HIV/AIDS communication through psychodrama process. It utilized the strengths of both qualitative and quantitative research. Using purposive sampling, three wards were selected in Msambweni Sub-county. A sample of 40 which constituted 29.25% of the total population of Lamukani CBO was drawn. The male and female representation was 21 and 19 respectively. The study consisted of participant observations and participant focus group discussions (entrenched in psychodrama process). Thematic and conversational analyses were used in assessing the variables associated with effective HIV/AIDS communication. Quantitative data analysis was used to authenticate participants’ insights and observation. The findings show the efficacy of psychodramatic role-playing in HIV/AIDS communication. The psychodrama process enhanced participative communication among the youth. This facilitated empathy which led to improved insights and social awareness among the participating youth. The process facilitated increased group efficacy leading to group advocacy against HIV/AIDS risk factors in selected schools in their community. Psychodramatic role training also helped the participants to realize their individual weakness and difference. This helped the participants improve on social skills. Psychodramatic role-playing also proved to be an instrument of therapy that can enhance positive attitudes and improve the perceptions of the youth towards HIV/AIDS. For instance, some of the youth who had never tested for HIV/AIDS because of stigma overcame their fears after experiencing the process. In some instances however, the outcomes show that if psychodramatic role-playing is not facilitated with expertise, it can be a source of inhibitions that hinder HIV/AIDS communication among the youth by generating fear and stigma. The findings will make a positive contribution to the use of theatre in HIV/AIDS communication programmes. The outcome indicates that psychodramatic role-playing has a participatory focus which can build on conventional theatre to enhance bottom-top communication in facilitating social learning.
TRANSFORMATIVE CONFLICT RESOLUTION USING FORUM THEATRE: 
THE JOS NORTH, NIGERIA FLASH POINT PARADIGM

ESTHER AKUMBO NYAM – Ph.D

Department: Film and Theatre Arts

Supervisors: Dr. Oluoch Obura

Dr. John Mugubi

Violent conflict in Jos North, Plateau State, Nigeria, like other parts of the world, has become a serious concern creating a rift in human relations. This study therefore seeks to explore, in Theatre for Development (TFD), the techniques of Boal’s Forum Theatre (FT) in bringing about peaceful resolution in Jos, Plateau State. The study explores the philosophical thrust of forum theatre to improve on the existing process of utilizing the challenges and strategies of FT for sustainable results. FT has today continued to interrogate several ways of resolving such issues and identifying ways of intervention and stoppage of further escalation of the violent conflict in the city of Jos. The study explores the assumption of Boal’s Forum Theatre technique in FT as appropriate instrument of transformation and change. This theatrical and drama process in FT was perceived relevant in resolving the Jos violence. TFD was used effectively in an attempt to bring about transformation, conscientization and social change. The theoretical and conceptual framework is based on the assumptions that the study was appropriate in resolving the Jos violent conflict. The study adopted a case study design to explore new ways of repositioning the practice of FT. Using triangulation, three locations in Jos, Plateau State Nigeria were selected and 110 participants were randomly selected across the sample population to take part in this qualitative study. This study involved Focus Group Discussions (FGDs), Semi Structured Interviews (SSIs), questionnaire administration, Participant observation approach which were employed to access FT methods as an effective medium for transformation and change. The findings show that FT activities employed in the study area for addressing violent conflicts include: drama, songs, music, peace rally and children’s theatre. However, inadequate monitoring and evaluation by practitioners, funding, advocacy and community involvement were found to be the challenges. As a means of mitigating the challenges, the study found that peace building, public enlightenment and advocacy, intensifying security, addressing segregated settlements, among others, are possible solutions.
Exclusive breastfeeding (EBF) has been demonstrated to have numerous benefits both to the mother and the infant. Inappropriate feeding practices can have profound consequences for the growth, development and survival of infants and children. EBF protects infants against infections such as respiratory infections, diarrhoea and reduces the risk of the mother developing obesity, breast and ovarian cancer among others. Despite various efforts to promote exclusive breastfeeding, the rate in Kenya is still low at 61% though there has been major improvement. Various research findings have documented inadequate knowledge on exclusive breastfeeding as a contributing factor to the rate of exclusive breastfeeding. However, there is limited scientific data on the gap between the sources of information, content and maternal knowledge on exclusive breastfeeding in relation to exclusive breastfeeding of infants in Kenya’s urban slums. This study aimed to investigate the sources and content of maternal knowledge on exclusive breastfeeding among mothers with infants aged 0-6 months in Kibera urban informal settlements, Nairobi. The study adopted a cross-sectional analytical design and targeted 293 mothers-infant
pairs who were selected using systematic random sampling. Simple random sampling was used
to select ten health facilities where mothers from Kibera seek health services. A researcher-
administered questionnaire was used to collect data on EBF. A key informant guide was
administered to the nutritionists to elicit in-depth information on maternal knowledge on
exclusive breastfeeding and information gap in relation to practice of exclusive breastfeeding.
Focus group discussions (FGDs) were conducted with mothers in various health facilities to
build up on the discussion. Data was entered using CS Pro software and analyzed using SPSS
version 16 software. Results showed that more than a half (54.8%) of the mothers first learnt or
heard about exclusive breastfeeding from the health professional, 30.5% obtained the
information from relatives and friends while 2.1% obtained from television and mothers booklet
respectively. Among the mothers who participated in the study, 57% reported that they had learnt
about exclusive breastfeeding, 17% reported that breast milk improves immunity while 7% had
learnt about proper attachment. The mean knowledge score for all mothers on exclusive
breastfeeding was 7.70 ± 1.47 which was an indication that mothers were knowledgeable on
exclusive breastfeeding. There was a significant association between sources and content
received by the mothers (chi-square test; p=0.02). Moreover, there was a significant correlation
between content and the knowledge scores among the mothers (Pearson correlation; r=0.93,
p=0.01). There was no significant association between maternal knowledge and the mothers who
ever breastfed their infants (chi-square test; P=0.93), maternal knowledge and breastfeeding
initiation (chi-square test; P=0.75), maternal knowledge and mothers who gave pre-lacteal feeds
(chi-square test; P=0.09), maternal knowledge and mothers who gave post-lacteal feeds (chi-
square test; P=0.53), maternal knowledge and breastfeeding within the last 24 hours (chi-square
test; P=0.19). However, There was a significant association between maternal knowledge and
introduction to food by the mothers (chi-square test; P=0.01). The community needs to be more
sensitized on EBF information. This will ensure that the friends/relatives or even the
grandmothers are aware of the correct information on EBF therefore not misleading the nursing
mothers.

COMPARISON OF KNOWLEDGE, ATTITUDES AND PRACTICES ON EXCLUSIVE
BREASTFEEDING BETWEEN PRIMIPAROUS AND MULTIPAROUS MOTHERS
ATTENDING WAJIR DISTRICT HOSPITAL, WAJIR COUNTY, KENYA
Exclusive breastfeeding (EBF) is recommended up to 6 months of age, with continued breastfeeding along with appropriate complementary foods up to two years of age or beyond. Failure to exclusively breastfeed for six months is associated with increased risk of childhood mortality and morbidity. There is paucity of information that analyses the disparity in Knowledge, Attitudes and Practices (KAP) among primiparous and multiparous mothers. This study aimed to compare the KAP of EBF between primiparous and multiparous mothers attending Wajir County hospital, Wajir County. In a cross-sectional comparative analytical study, KAP on EBF were assessed based on structured researcher-administered questionnaires, Key Informant Interviews (KII) and Focus Group Discussions (FGD) for a total of 280 mothers; primiparous (n=140) and multiparous (n=140) with infants 0-5 months of age. The KII was conducted with the healthcare providers at Wajir District Hospital while FGDs were conducted with mothers exclusively breastfeeding and those not exclusively their babies. Data were entered and analyzed using SPSS. Descriptive statistics was used to describe the study population demographic characteristics, knowledge, attitudes and practices of both primiparous and multiparous mothers. T-test was used to test for significant differences between primiparous and multiparous for continuous data. Chi-square test and odds ratio were used to test the association between EBF and categorical variables. Statistical significance was set at p< 0.05. Qualitative data was transcribed, and common themes identified. Results showed high maternal knowledge on breastfeeding in both group mothers. The attitudes towards EBF were also positive. Nonetheless, high maternal knowledge and positive attitude did not necessarily translate into the practice of EBF. This was attributed to socio-cultural factors deeply rooted in the community that influenced infant and young child feeding practices. Overall, the prevalence of EBF was 45.5% (primiparous women 39.4% and multiparous women 49.3%) with no significant differences between the mothers. The low EBF rate may be attributed to the over 50% of mothers getting breastfeeding information from traditional birth attendants (TBAs) and
family/friends/relatives compared to 38% receiving the same information from health facility. Additionally, cultural practices that propagate the early introduction of prelacteals were hindrances to EBF practices. The study established no significant relationship between maternal knowledge and EBF practice. In contrast, maternal attitude score was significantly associated with the practice of EBF. Those mothers with a positive attitude towards EBF were more likely to EBF (chi-square test; p=.001). There was no significant relationship in maternal sources of information and parity (chi-square test; p>0.05). The study showed that infants’ age and morbidity as well as maternal morbidity and breastfeeding complications had significant negative associations with exclusive breastfeeding. There was no association between maternal socio-economic and demographic characteristics with exclusive breastfeeding. It is recommended that Ministry of Health (MOH) design effective community based programmes to improve breastfeeding practices by establishing or strengthening community-based structures (mother to mother breastfeeding support groups, community health workers, volunteers and Traditional Birth Attendants) and linking them to the health facilities for training, support and monitoring. The study also recommends MOH to maximize on the opportunities of integrating EBF campaigns with other community based interventions like community based management of severe acute malnutrition; malnutrition screening, social protection and food security programmes.
Adolescent overweight and obesity have been observed as one of serious public health challenges of the 21\(^{st}\) century by the World Health Organization (WHO). Over the past few decades adolescent food consumption has undergone a great deal of transition from the starchy carbohydrates from roots and tubers to the highly refined cereals and sugary beverages. The highly refined cereals consumption contributes in no small measure to body adiposity. Physical inactivity further aggravates the calorie-imbalances that will later develop into overweight and obesity. This study determined the food consumption pattern and physical activity and overweight and obesity among the secondary school students in Kwara state, Nigeria. Cross-sectional analytical design was used in this study. A total of 515 adolescent students were randomly selected using multistage and stratified sampling techniques from 8 public secondary schools in two zonal inspectorate divisions. The instruments of data collection used were a modified food frequency questionnaire and Physical Activity Questionnaire for Adolescents (PAQ-A). Digital bathroom scale and stadiometer were used to measure the weight and height of the students respectively and observation checklist was used to assess the functionality of school facilities. Data was analyzed using statistical package for social sciences (SPSS, Version 20) and WHO anthroplus package. Food consumption pattern of participants indicated that 77% consumed breakfast and 4.5% added more than 5 teaspoonful of sugar to their beverages daily. The participants mostly consumed refined carbohydrates was doughnut and biscuits (2.36±0.99) times per week, while mostly consumed fat and oil was vegetable oil in soup (2.54±0.96) times per week. Furthermore, the fatty protein mostly consumed was fish pies and fish rolls (2.71±0.87) times per week and mostly consumed fruit was pawpaw (2.56±0.89) times per week. Participants’ hours of sleep indicated that 50.3% had 7-8 hours of sleep daily. Physical activity level indicated that 48.7% were moderately active and 39.4% were highly active per week. Observation checklist results indicated that all the schools had functional sporting facilities (100%). Body mass index (BMI) for age of participants showed that 29.1% were underweight, 4.7% were overweight while less than 1% were obese. The Pearson correlation between BMI for age and food consumption pattern (FCP) was (r=0.012, p =0.785), BMI for age and physical activity level (r=-0.105, p= 0.017). ANOVA of BMI for age and food consumption pattern showed significance (p= 0.001). There was no significant difference between BMI for age and the metabolic equivalent scores (METs) of the participants (p=0.725). Despite the relatively low prevalence of overweight and obesity observed, of concern was high underweight and low BMI for age in this study. Result findings indicated low frequency of food consumption and moderate physical activity levels. The parents and guardians should improve on the frequency of consumption of nutritious food for the adolescent students in public secondary schools and their physical activity level should be sustained.
PREVALENCE AND DETERMINANTS OF IRON-DEFICIENCY ANAEMIA AMONG CHILDREN 6-23 MONTHS ATTENDING THIKA LEVEL-5 HOSPITAL, KIAMBU COUNTY, KENYA

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It is evident that iron in childhood is key for proper health and cognitive development as it is required for academic and work productivity in adulthood. Intake of iron rich foods, sanitation, health, economic and socio-demographic factors are principal determinants of Iron-deficiency anaemia (IDA) in children. There is paucity of data concerning the prevalence of IDA in children aged 6-23 months since most studies focus mainly on the selection of iron rich foods as criteria for determining those at risk of IDA. The age limit in most of these studies is 5 years and above. There is limited scientific data on the prevalence and determinants of IDA in children aged 6-23 months old in Thika Level 5 Hospital attending well baby clinic (WBC). A cross-sectional analytical study design was adopted for the study in the month of May 2013. The study targeted a sample size of 241 children selected by systematic random sampling method. Data were collected by researcher administered interview schedule given to mothers or caregivers of the children attending the WBC at Thika Level 5 Hospital. This was followed by a collection of venous blood samples from children for hemoglobin, red cell width and mean cell volume determination conducted by a trained laboratory technician. The study participants were also followed up to their homes at a later date to quantify the utensils used to measure food. The data were cleaned coded and analyzed using SPPS Version 20. Data on dietary intake was analyzed using Nutri-survey statistical package (2008) and ENA for smart (2008) was used to analyze anthropometry. Descriptive statistics were used to describe the daily intake of nutrients, sanitation, economic and socio-demographic factors. IDA status was based on hemoglobin levels while predictors of complementary feeding practice were considered an indicator of proper food intake. Chi-square test was used to determine the relationship between IDA with dietary intake of iron-rich foods and complementary feeding practices. Binary logistic regression was used to test the significance between IDA with malaria, helminthic infestation and immunization status. The level of significance of accepting the null hypotheses was <0.05. The minimum dietary diversity was (34%), minimum meal frequency (58%) and minimum acceptable diet was (58%). Binary logistic regression analysis revealed significant relationships between malaria with IDA (ODDS Ratio [OR] =2.95, CI=0.72-3.22, p=0.013), helminthic infestation with IDA (ODDS Ratio [OR] = 3.87, CI=0.84-4.12, p=0.001) and immunization status with IDA (ODDS Ratio [OR] = 2.98, CI = 0.63-3.16, p=0.032). Mean hemoglobin values from the present study were found to be (8.3 ± 2.3g/dl) whereas the overall IDA prevalence was (73.2%) indicating severe IDA among children attending a WBC at Thika.
Level 5 Hospital. Determinants of IDA included; the age of the child, education of the caregiver, the occupation of the caregiver, complementary feeding practices, dietary intake of iron-rich foods, rubbish waste disposal, human waste disposal, the presence of stagnant water, malaria infection, deworming practices, helminthic infection and immunization. Aggressive awareness campaigns targeting proper complementary feeding and proper iron–rich diet for mothers with under five-year children in hospitals, markets and chief’s barazas should be launched by all stakeholders in (IYCF) Infant and young child feeding. A follow up study to assess the relationship between nutritional status and IDA along with associated factors in children from birth up to 10 years should be done to establish any link between nutritional status and IDA and the possible effect on their development milestones.

CONTRIBUTION OF YOUTH SELF HELP GROUP INITIATIVES TO SOCIO-ECONOMIC WELLBEING OF YOUTH IN DANDORA, NAIROBI CITY COUNTY, KENYA

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Estimates reveal that 1.2 billion (17%) of the world population is youth aged 15 to 24 years who constitute 40% of the world’s unemployed. While the developed world has some strategies to cushion youth against unemployment, the developing and underdeveloped world are struggling with this phenomenon. Approximately 36% of Kenya’s population are youths who remain marginalised and unable to contribute to their full potential in national development. Whereas numerous studies have been conducted on youth issues, a review of literature reveals a gap of information on how Youth Self Help Group (YSHG) initiatives transform the youths’ socio-
economic wellbeing. This study sought to assess the contribution of youth self help group initiatives to socio-economic wellbeing of youth in Dandora, Nairobi County, Kenya. Objectives of this study were to: examine whether initiatives undertaken by youth in registered YSHGs in Dandora contribute to their socio-economic wellbeing, evaluate the influence of key challenges facing registered youth self help groups on socio-economic wellbeing of youth in Dandora, assess the influence of key opportunities available for registered youth self help group initiatives on socio-economic wellbeing of youth in Dandora, examine the influence of sustainability strategies adopted by registered YSHG initiatives on socio-economic wellbeing of youth in Dandora and assess the socio-economic wellbeing of YSHG members before and after joining YSHG. The hypotheses of the study were there is no significant relationship between the YSHG initiatives, challenges, opportunities, sustainability strategies adopted and contribution of YSHG to the social economic well being of youth in Dandora. The study used the cross-sectional survey research design. The target population was all the 16 registered YSHGs in Dandora. Dandora was purposively sampled. YSHGs groups registered with Youth Initiative Kenya (YIKE) were also purposively sampled. Proportionate random sampling was used to acquire the number of items to be included in sampling frame proportionate to the number of members in each group. Simple random sampling was used to acquire the respondents for the study. The findings of this study indicated that some of the reasons for starting YSHGs was to create job opportunities, increase personal income, and gain new skills. Key initiatives undertaken by YSHGs included running cyber café, electronic & retail shops and initiatives geared towards environmental conservation such as garbage collection and tree planting. Findings indicated improved socio-economic wellbeing among the YSHG members. Indicators with greatest improvement in economic wellbeing were savings (63%), income (62%) and asset acquisition (47%). Leading social indicators of wellbeing included access to training (73%) and opportunity for apprenticeship (63%). Chi-square tests revealed significant relationship between social-economic wellbeing and the YSHG factors (initiatives undertaken (p=0.015), financial challenges facing registered YSHG initiatives ( p=0.034), financial opportunities available to YSHGs (p=0.041), collaboration and partnership opportunities (p=0.013)sustainability strategies adopted by YSHG in terms of opportunities for collaboration( p=0.048). Z-Test revealed significant difference in socio-economic wellbeing of YSHG members before and after joining YSHG (p=0.016). Multiple regression analysis revealed that key challenges was the most predictive variable at
(p=0.000) followed by opportunities (p=0.001) and initiatives (p=0.019) to social economic wellbeing. From the research findings, it was concluded that YSHGs are a good platform via which development programs can target youth to improve their social economic well being. It was recommended that youth in self helps groups be provided with financial training, formal education, psycho-social support and training in project management and proposal writing. There is need for government to streamline financing mechanisms for access to devolved funds particularly Youth Enterprise Development Fund and Uwezo Fund by the youth.

ASSESSMENT OF THE EFFECTS OF Khat CONSUMPTION ON THE WELLBEING OF FAMILIES IN MERU COUNTY, KENYA

RUTH KAGWIRIA MUGAMBI- Ph.D.

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This study assessed the effects of Khat consumption on the wellbeing of families in Meru County. Wellbeing is a condition of holistic health in all its dimensions, namely; physical, social, and psychological. Accordingly, this study endeavoured to establish the prevalence of Khat consumption in Meru County; to find out the socio-economic drivers of Khat consumption; to determine the effects of Khat consumption on the physical health of consumers’ families; to establish the influence of Khat consumption on the social health and psychological aspects of Khat consumers’ families. The study adopted a descriptive cross-sectional research design. Meru County was purposively selected for this study because it is predominantly a Khat growing and consuming county. Additionally, Khat plays a major role in social occasions such as marriage negotiation process to date. Threesub-counties were purposively selected for this study due to limited financial resources. A multi-stage sampling technique involving purposive, simple random and systematic methods were used to select the county, three sub-counties, six wardsand 583 respondents. Pilot study was carried out to establish content validity and reliability. Reliability was established using Cronbach’s alpha coefficient and the Likert scales used had a
reliability of above 0.7. In line with ethical considerations, respondents comprised of adult family heads (male or female) of age eighteen(18) and above only. The study used primary data gathering instruments, namely, interview guides and observation checklists. The Statistical Package for Social Sciences (SPSS version 16, 2007) was used in data management and analysis. In the analysis, descriptive statistics used included percentages and frequency distribution tables. These descriptive statistics were used to summarise variables into thematic areas and to convey the characteristics of key variables. Inferential statistics used included Pearson’s Chi-square and Simple Linear Regression analysis. Inferential statistics were also used to establish relationships, provide predictions and in drawing conclusions. Focus Group Discussions were carried out, summarized, categorized and emerging themes used in the discussion to augment quantitative information. Research findings revealed that Khat availability was the main driver for its consumption. The respondents consumed Khat in groups mostly with their friends, family members and business associates. The mean age of the Khat consumers was 43. Low levels of education were reported with only 16.1% having attained college/University education. Pearson’s Chi-Square ($\chi^2$) test indicated that, there was a significant relationship between hours spent chewing Khat and the wellbeing of families. Linear regression analysis indicated that, there is no relationship between Khat consumption and lack of sleep as well as consumers’ happiness. Linear regression analysis indicated that there is a positive relationship between Khat consumption and consumers’ education status, marital instability, poor family relationships, addiction and low investment with p-values of 0.000, 0.000, 0.003, 0.003, and 0.000 respectively. It was concluded that availability of Khat and peer pressure encouraged Khat consumption, thus influencing the physical, social and psychological wellbeing of families. The study recommended that NACADA should create awareness in Khat chewing communities on the negative effects of Khat consumption. The study also recommended that, the Ministry of Agriculture through the field extension officers should engage with the Khat farmers to find alternative economic livelihoods to cut the supply chain and hence reduce Khat availability to the consumers.

Ph.D

IMPACT OF SPIRULINA CORN SOYA BLEND ON PROTEIN ENERGY MALNOURISHED AND IRON DEFICIENT CHILDREN AGED 6-23 MONTHS IN NDHIWA SUB-COUNTY-KENYA

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Protein Energy Malnutrition (PEM) and iron deficiency Anemia (IDA) affect children below five years globally. Studies in Kenya show levels of stunting (26%), wasting (4%), underweight (11%) and low iron intakes (7%) among children aged 6-23 months. These children are at critical period of rapid growth marked by malnutrition which can be irreversible if not effectively addressed. The standard CSB to manage PEM is inadequate in energy and micronutrients. Spirulina powder is richer in proteins and iron than soya bean and if used to fortify CSB would provide a more energy dense and iron rich flour than standard CSB. The SCSB can be produced locally by households to ensure nutritious consumption for under-nourished children than CSB. The objective of the study was to determine impact of SCSB on PEM and IDA among children aged 6-23 months in Ndhiwa Sub-County through a randomized controlled trial. A total of 240 children with PEM and IDA were accessed at Ndhiwa Sub-County Hospital and randomly assigned to two experimental groups (EG1 received SCSB while EG2 received standard CSB) and one control group who did not receive any treatment during the intervention. Data was collected using a questionnaire and a Focus Group Discussion (FGD) guide. PEM was assessed using the following indicators; plasma Retinol Binding Protein, WHZ and WAZ scores while iron status assessed based on Hematocrit levels. Relative Risk, Difference in Difference and Log-rank tests were used to compare impact of SCSB and standard CSB on PEM and IDA while logistic regression used to identify predictors of plasma RBP, Hct levels, WHZ and WAZ. At baseline, assessment of plasma RBP and Hct levels was done. In addition nutrient content analysis of spirulina powder, SCSB, CSB and maize flours was done for carbohydrates, proteins, fats and iron, and production of SCSB and CSB flours used in the intervention. Intervention was done for 6 months and involved daily consumption of 100g SCSB and CSB flours while doing assessments of key variables up to six months. The SCSB was significantly higher in energy (5.4±0.1Kcal/100g vs 2.9±0.7 and 2.8±0.3, p=0.036), protein (20.84±0.2 vs 15.47±0.2 and 0.06±0.1, p=0.043) and iron (15.32±0.2 vs 6.15±0.3 and 0.81±0.2, p=0.043) than CSB and maize meal. The children who consumed SCSB significantly improved in RBP status (RR:3.07;CI:2.62-2.72,p=0.004 and RR:4.06;CI:3.63-3.76,p=0.0001), Hct status (RR: 3.15;CI:1.91-2.07,p=0.002 and RR:4.07;CI:3.66-3.79,p<0.0001), wasting (RR:3.10;CI:0.001-0.48,p=0.0001 and RR:4.08;CI:3.37-3.58,p=0.0001) and underweight (RR: 3.16;CI:3.58-3.91,p=0.0001 and RR:4.18;CI:3.05-3.27,p=0.0001) compared to children who consumed CSB and those in control group. The children who consumed SCSB had faster recovery from PEM and IDA compared to children who consumed CSB and children in control group. The breast fed children consuming SCSB were significantly meeting RDAs for energy (913.8±149Kcal vs 727.8±125 and 654±114,p=0.011 ), protein (15.2±8g vs 8.9±3 and 8.2±2, p=0.004) and iron (15.9±0.3mg vs 6.0±0.7 and 4.3±0.8, p=0.004) as well as non-breastfed; energy (832±116Kcal vs 781±93 and 652±102, p=0.022), protein (19.9±8 vs 8.3±3 and 6.2±4, p=0.001) and iron (15.9±0.1 vs 7.1±0.2 and 4.9±0.6, p=0.002) compared to children who consumed CSB and those in control group. There were no significant difference in the acceptability attributes of mothers/caregivers of children who consumed both SCSB and CSB porridges (chi-square: p>0.005). The SCSB had a significantly higher impact on PEM and iron deficiency than standard CSB and control group. The use of spirulina powder as a fortifier for commonly consumed cereals in Kenyan communities is recommended.
Herbal medicine, commonly referred to as alternative medicine, has been treated with a lot of skepticism among the conventional medicine practitioners. It has been described as inferior to conventional medicine with no proven safety and efficacy, perhaps only associated with rural areas where conventional medicine is not easily accessible. Thus, with economic progress and advancements in conventional medicine, one would expect decline in herbal medicine consumption. In Kenya, 70% of the population is dependent on herbal remedies for their ailments. This is against a backdrop of improved access to conventional medical facilities, attributable to increasing sector development expenditure. Therefore, this thesis sought to analyse the factors that influence herbal medicine consumption by univariate logit approach; establish joint consumption for both conventional and herbal medicine by bivariate probit approach; estimate economic value of herbal medicine by Willingness-To-Pay approach and; establish herbal consumption relationship to herbal medicine availability in Kakamega forest by qualitative analysis. Overall, the thesis makes contribution in terms of both literature and methodology. Results showed that consumption of conventional medicine and herbal medicines were indeed inter-dependent. This decision was influenced by gender, education, price of conventional medical treatment, distance to medical facilities, and health insurance cover. Kakamega forest herbal medicines were found to have an economic value. Herbal medicine cultivation influenced 72 percent of the total economic value. Herbal medicine biodiversity was found to be declining due to over-harvesting for consumption. This was influenced by wild exploitation from the forest. The policy implication of these findings is that, herbal medicine remains important but its efficacy should be verified and regulated to protect consumers. In the short and medium term, the government should provide well targeted subsidies on medical services to eliminate the dangers of consumers falling into the traps of unscrupulous providers of unproven herbal remedies. To harness their economic value and reduce wild exploitation, the
government and non-governmental organizations should implement incentives that will encourage production of herbal medicines with proven safety and efficacy. This could be tenable by monitoring wild exploitation and developing herbal inventory.

Ph.D

EFFECT OF CLIMATE VARIABILITY ON OUTPUT AND YIELDS OF SELECTED CROPS IN KENYA

GEORGE MBUGUA KARIUKI – Ph.D

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Supervisors: DR. JENNIFER NJARAMBA

Prof. OMBUKI CHARLES

The agricultural sector plays a critical role in the Kenyan economy; it contributes to about 30 percent of the country’s Gross Domestic Product (GDP) and employs over 40 percent of total population. It also accounts for more than 60 percent of export earnings and about 45 percent of government revenue. Indeed the sector forms a strong base for food security, creation of employment and generation of foreign exchange. Majority of industries in Kenya are agro-based, making the agriculture sector central to the country’s development strategy. The agricultural sector largely depends on climate variables and is highly sensitive to climate variability such as a change in temperature and precipitation. These changes can potentially compromise agricultural production thereby have negative impact on rural economy, food security, trade balance and foreign exchange earnings. It is therefore imperative to understand the effects of the changing temperature and rainfall patterns in Kenya, to which this study has contributed by way of analyzing the responsiveness of major agricultural crops to climate variability. The crops considered namely maize, tea and coffee, play a significant role in Kenya's economic growth. Maize is critical to food security while tea and coffee are important for the improvement of trade balance, foreign earnings, employment, income generation, poverty alleviation as well as economic growth and development. However, maize production has greatly fluctuated leaving about 40 percent of population food insecure. In addition, the growth rate of tea and coffee production shows a falling trend over the study period that could adversely affect foreign exchange earnings, income generation and food security. The study utilized secondary data on respective variables in the period between 1970 and 2014. Data was collected from various
government publications, Kenya Meteorological Department and FAOSTAT. The study adopted modeling approach. The study findings show that climate variability has adverse effects on crop output and yield. In addition, the study finds a non linear relationship between crop yields and seasonal rainfall and mean temperature. However, the direction and magnitude of the effects vary depending on the season. Moreover, the findings show a negative effect of temperature variability on crops output and yield. Hence, there is need to elevate the potential of rain fed agriculture in the midst of the risks posed by climate variability. The study recommends harvesting and efficient use of water to support rainfed agriculture and provides ground for government action in establishing measures towards mitigation and adaptation to climate variability. As well, climate variability affects the optimal requirements for crop growth and development at various stages and thus policies targeting non-rain fed agriculture could be most appropriate.

SCHOOL ENGINEERING

Masters

A LOW COST WATER CONSUMPTION METER SYSTEM BASED ON GSM TECHNOLOGY

MWANGI PETER NGUGI – M.Sc

Department: Engineering

Supervisors: Prof. Elijah Mwangi

Dr. Patrick Karimi

In the water distribution industry, meter reading is an important activity as source of revenue to the water utility company and at the same time it is meant to ensure accurate recording of
consumption. Manual water meter reading is still being done in many countries in the world where employees of water companies take the readings from residential and business premises. Water bills are then prepared based on this data. This process is inefficient and costly in terms of man-hours, especially with the increase in residential houses in most of urban areas. The employees of water companies also face some difficulties in accessing some premises especially in the slum areas and hence the meter readings in such areas are estimated. The process of manual meter reading is both cumbersome and inaccurate. Different researchers have used different technologies in order to automate meter reading but very little has been done using the GSM technology. In addition to this, the earlier designs were expensive. In this research a prototype of an automatic water meter reading system has been designed, fabricated and tested. It consists of G1/2 flow sensor, PIC18F4550 microcontroller and its interfacing board, SIM 900 GSM module, solenoid control valve. G1/2 flow sensor has been used for water flow detection, the solenoid control valve has been used to connect or disconnect the water supply and the GSM module has been used for sending short messages on water volume consumption while the entire system is controlled by PIC18F4550 microcontroller. In this design as water flows through flow sensor, the rotor blades rotate generating pulses. The pulses are counted and converted to a volumetric flow using the PIC18F4550 microcontroller. The volume of water consumption is displayed on an LCD. The water meter reading is sent automatically to the Water Company as a short message for billing purposes after a specified period. The designed system has been found to be about 98% accurate and is cost effective. It has the potential to automate water meter reading and hence increase efficiency.

Ph.D