MOLECULAR CHARACTERIZATION AND NON-CHEMICAL MANAGEMENT OF ROOT-KNOT NEMATODES (*Meloidogyne* spp.) ON AFRICAN NIGHTSHADES IN SELECTED PARTS OF KENYA

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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. sarrachoides* 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.

ASSESSMENT OF PROFIT EFFICIENCY AMONG SWEET YELLOW PASSION FRUIT FARMERS IN MBEERE SOUTH, EMBU COUNTY

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The horticulture industry in Kenya has been very successful in the last one and a half decades. This subsector has grown to become a major employer and foreign exchange earner. In 2014, fruits contributed Kshs. 51.5 billions accounting for 22% of the domestic value of horticultural produce. The sweet yellow passion fruit variety is gaining adoption in Mbeere South Sub-county due to its apparent adaptation to the hot arid conditions and a ready market. Efforts had been made to promote the production and marketing to boost smallholder farmer income by various passion fruits stakeholders. Despite the efforts, profit levels were considered to be dismal as some farmers were investing highly to the fruit agribusiness venture but ending up making losses due to high production costs. The causes of the varying profits had not been empirically established. The economic/profit efficiency level of the agro-enterprise was therefore unknown and further the use of agricultural credit on the sweet yellow passion fruit by smallholder farmers in Mbeere South was not known. Therefore, the objective of this study was to analyze profit efficiency levels among smallholder sweet yellow passion fruit farmers, to determine the influence of socio-economic and institutional factors to profit efficiency among sweet yellow passion fruit farmers, and to measure the use of credit among sweet yellow passion fruit farmers in Mbeere South sub-county. This study used primary data which was obtained from smallholder farmers.
farmers through a semi-structured questionnaire that was administered to farmers through an interview schedule. In this study, the target population was defined by the smallholder farmers producing sweet yellow passion fruit and the sample size was 90. A purposive sampling method was employed to select Mbeere South as the area of study and a systematic random sampling method was used to select two locations from each division in the district. Systematic random sampling at an interval of 1 respondent was used to select a sample from each division for the study; that is every second sweet yellow passion fruit farmer was selected. The obtained data was analyzed using Stochastic Frontier Analysis (SFA) method and descriptive statistics by running a model on frontier 4.1 version and STATA 11 Softwares respectively. The study showed that the profit efficiency levels ranged from 23% to 90% with a mean of 76% implying that an estimated 24% profit loss was being made due to a combination of both technical and allocative inefficiencies. The study also found out that the frequency of farming experience, group membership and access to market information influence profit efficiency significantly. Therefore it is recommended that extension education investments should be scaled up through producer organizations to improve agricultural productivity and agricultural marketing through proper search and use of marketing information.

SOCIO-ECONOMIC FACTORS INFLUENCING SMALLHOLDER PUMPKIN PRODUCTION, CONSUMPTION AND MARKETING IN EASTERN AND CENTRAL KENYA REGIONS

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Pumpkin is an indigenous vegetable with huge potential to provide nutrition, food security and income to households in Kenya but its production remains low. The crop has been given little attention in research and has not been promoted as a viable enterprise. Literature indicates that socio-economic factors and farming constraints in pumpkin production, consumption and marketing by smallholder farmers in Eastern and Central Kenya have not been studied nor documented. This research was carried out to assess these factors and constraints in order to inform the development of appropriate policy interventions for improved pumpkin production,
consumption and marketing. The study was carried out in eight major pumpkin growing Sub-
Counties in the semi-arid areas of Eastern Kenya and medium altitude areas of Central Kenya. 
The objectives of the study were to (a) assess the influence of demographic and socio-economic 
factors on pumpkin production; (b) analyze uses of pumpkin products and socio-cultural 
practices in pumpkin consumption by smallholder farmers; (c) determine farm households, 
traders and market characteristics influencing pumpkin marketing; and (d) identify and analyze 
the major constraints in smallholder pumpkin production and marketing in Eastern and Central 
Kenya regions. A household survey of 260 pumpkin growing households and a market survey of 
172 primary traders were conducted using structured questionnaires. The collected data were 
analyzed using descriptive statistics, multiple regression and Tobit model analysis with the aid of 
SPSS and Stata computer software. The research showed that pumpkin productivity by 
smallholder farmers in Eastern and Central Kenya regions was below the national average of 20 
tons per hectare. Age and education level of household head, household size, on-farm income, 
farm area under pumpkins and engagement in off farm activities were statistically significant and 
positively influenced smallholder pumpkin production in Eastern and Central Kenya. Pumpkin 
fruits and leaves were mainly used as food while seeds were mainly used for planting by 
majority of the households. Household size and distance to market were statistically significant 
with negative influence on the marketed pumpkin proportion among farm households in Eastern 
and Central Kenya. Membership in farmers group was significant in Eastern Kenya while market 
price and gender of household head were significant in Central Kenya. These factors positively 
influenced the proportion of marketed pumpkin among the farm households. Market price, 
membership in marketing associations, selling frequency and distance to market were 
statistically significant and positively influenced market participation by pumpkin traders in 
Eastern and Central Kenya. The major constraints in pumpkin production were pests, diseases 
and insufficient rainfall while the main marketing constraints were poor market prices, 
exploitation by brokers, post-harvest losses, inadequate market information, low consumer 
awareness and low demand. The proposed policy interventions include farmers’ education and 
strategies to promote pumpkin production, strategies to enhance access to physical markets and 
market information, organizing farmers into marketing groups, improvement of market 
infrastructure and organizing pumpkin traders into marketing associations or groups.
CONSUMER PERCEPTION, ATTITUDE AND PATRONAGE TOWARDS PURCHASE OF IMPORTED VERSUS LOCALLY-PRODUCED APPAREL IN NAIROBI COUNTY, KENYA

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The purpose of this study was to analyze consumer perceptions, attitude and patronage towards purchasing locally-produced versus imported apparel among public servants in Kenya. The objectives of the Study were: to establish the attributes that professionals consider in selecting apparel; to determine the perception of public servants towards locally-produced and imported apparel; to establish the factors that influence the perception, preference and attitude of public servants towards locally-produced and imported apparel; and to establish the level of patronage of public servants in Nairobi on purchase of apparel products. The study adopted a survey design which was conducted within Nairobi County. A questionnaire was used to collect the primary data. The study targeted employees of the Central Government aged 25 years and above. The sampling procedure that was utilized was proportionate stratified multi-stage random sampling. From a population of 2000 employees, a sample size of 322 respondents was selected. The collected data was analyzed using statistical package for social science 17.0. Based on the findings of the study, it is clear that there is no variation in the attributes that consumers in Kenya consider when selecting apparel. The study findings also concluded that there is no significant difference in the perception of consumers in Kenya towards locally-produced and imported apparel. According to the findings both locally produced apparel and imported clothing are perceived in more or less the same standards. The findings showed that consumer attitudes toward locally-produced versus foreign apparel differed significantly. Consumers had an overall more positive attitude towards foreign apparel over Kenyan made apparel with regard to durability, quality, attractiveness, fashionableness, brand name, and choice of styles. However, no significant difference was found in consumer attitudes among various demographics, namely gender, age, income level and purchase frequency. Kenyan consumers preferred apparel originating in Eastern countries more than Western countries. Their three most preferred country of origin of apparel were Japan, America and China/Kenya, respectively. Interestingly, relative to other apparel attributes, a product’s country of origin was generally of low importance in consumer decision-making. For consumer ethnocentrism, the results indicated that there was a positive correlation between consumer ethnocentrism and attitude towards locally-produced apparel, but there was no negative correlation between consumer ethnocentrism and attitude towards foreign apparel. Furthermore, demographic variables did not show effects on consumer ethnocentrism. From the study, the following recommendations were made: quality and
ASSESSMENT OF CROWD MANAGEMENT STRATEGIES USED FOR FOOTBALL EVENTS IN GOVERNMENT-OWNED SPORTS STADIA IN NAIROBI COUNTY, KENYA

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Spectator violence in stadiums is part of a larger set of problems related to misbehaviour in football and it has resulted into deaths and injuries during football events, especially where rival football clubs are playing. This is specially exacerbated where fans seating arrangement is not properly demarcated. The purpose of this study was therefore to assess crowd management strategies applied by the management of government-owned sports stadia in Nairobi County, Kenya.

The management strategies the study sought to assess were mainly on security arrangements in terms of the pre-event, event and post-event preparations and arrangements.

The target population for the study comprised of 64 staff working at Moi International Sports Centre (MISC) and Nyayo National Stadium (NNS), 24 Football Kenya Federation (FKF) officials at National and Nairobi County levels, 304 police officers stationed at Kasarani Police division, Ngomongo Police Post, Langata Police division and Nyayo National Stadium Police Post. Sample size for football fans was calculated at 384 using Fishers’ formula since the total population for both MISC (60,000) and NNS (30,000) was estimated at 90,000.

Stratified random sampling technique was used to select the respondents, to ensure a fair representation of all the target groups. Self-administered questionnaire was used to collect data. The data collected was summarized into descriptive statistics of frequencies and percentages. Data presentation was carried out using graphs, bar-charts, tables and pie-charts. The null hypotheses were tested using chi-square at p < 0.05 level of association/agreement using SPSS version 20.

Findings revealed there was a level of agreement between the security/safety service personnel and football fans on the adequacy of stadia safety features where a higher proportion of both were of the opinion that the safety features were partially adequate. On pre-event strategies the findings revealed that the strategies used were viewed by a high proportion of the respondents as partially effective, with a departure on facility maintenance which was viewed as effective and advertising of penalties for misbehaviour while in the stadium which was indicated as ineffective. The stadia security/safety service personnel and the football fans generally agreed that the strategies used to manage crowds during football matches in the two sports stadia were partially effective. For the post-event strategies security/safety personnel and football fans were of the opinion that the strategies used to control crowds after a football match were generally partially effective. Based on the findings, it is recommended that the management of the two sports stadia should improve on all the strategies used to manage crowds during football matches.
matches. Further studies on crowd management strategies for football events need to be carried out in other government-owned and non-government owned sports stadia in Kenya.

PARTICIPATION MOTIVES AND COMPETITIVE ORIENTATION OF FOOTBALL PLAYERS IN THE KENYAN WOMEN PREMIER LEAGUE

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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.
VIEWS ON PHYSIOLOGICAL AND PSYCHOLOGICAL CHANGES AND THEIR INFLUENCE ON MATERNITY WEAR SELECTION AMONG WOMEN ATTENDING ANTE-NATAL CLINIC AT KENYATTA NATIONAL HOSPITAL

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The pregnancy period in human beings is divided into three trimesters. During this period expectant women experience psychological, behavioral and biological changes that make them more sensitive about their bodies. This is due to dramatic body changes, which to some extent trigger negative thoughts and feelings in some women. With the wide variety of body shapes and sizes, physiological changes occur differently for every pregnant woman. These variations lead to problems of comfort, fit and sizing of maternity wear especially if not well selected. Despite an increasing interest in fashion and clothing, researchers in Kenya have conducted limited study about dressing and adorning the pregnant body. This leaves pregnant women with minimal sources of reference thus relying on trial and error or copying what other pregnant women wear. Therefore there is need for a study that focuses on the views on physiological and psychological changes and their influence on maternity wear selection among expectant women. The objectives of the study were to: identify the views of young expectant women aged 16-35 years regarding their physical body changes during pregnancy, establish the views of these young expectant women regarding their psychological changes during pregnancy, determine the physiological and psychological changes that influence maternity wear selection, discuss the social economic factors that influence maternity wear selection among these young expectant women and determine dress features that influence maternity wear selection among these young expectant women. The researcher adopted a descriptive research design to collect data, analyze and present. Pre-testing was done on a sample of 12 respondents attending ante-natal clinics at KNH to avoid ambiguity of the instruments. Convenience sampling was used to select 96 young
expectant women. Interview schedules and questionnaires with open-ended and closed-ended items were used to collect data. Frequencies and percentages were used to summarize variables relating to demographic characteristics, young expectant women’s views on physiological and psychological changes and maternity wear selection. Data was grouped and summarized in tables and graphs. Open ended items were analyzed in relation to the responses given by the respondents while the quantitative aspects were analyzed using Microsoft Excel. The findings indicated that young expectant women experience dramatic changes in their body silhouette, measurement, posture and weight which they viewed either positively or negatively. It was also revealed that the young expectant women experienced psychological changes like anxiety, joy, stress, fear and depression with the outstanding one being anxiety as a result of the changes in their physical body. Most of the respondents were not happy with the psychological changes, which made them select maternity wear that was either ill-fitting or oversized. Furthermore, physiological and psychological changes did not influence the young expectant women when selecting their maternity wear. In addition, socio-economic factors like availability of money, cost of item, age and marital status highly influenced the respondents when selecting their maternity wear. Finally, all the young expectant women were influenced by colour when selecting their maternity wear. It was therefore concluded that young expectant women experience different views on physiological and psychological changes that influenced their maternity wear selection. Disparity in the way the young expectant women view these changes creates a need for each one of them to understand how to select maternity wear that is suitable in terms of sizing, fit and comfort. Ante-natal clinics in Kenya should consider including lessons on views on physiological and psychological changes and their influence on maternity wear selection among expectant women in their program.
FOOD CONSUMPTION PATTERNS, PHYSICAL ACTIVITY AND OVERWEIGHT AND OBESITY AMONG SECONDARY SCHOOL STUDENTS IN KWARA STATE, NIGERIA

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Adolescent overweight and obesity have been observed as one of serious public health challenges of the 21st 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.
All firms aim at achieving and sustaining competitive advantage, leading to high performance. However, they face challenge on how to achieve and sustain this performance, especially in a rapidly changing environment. Empirical studies indicate that this can be achieved if the firms understand drivers of their competitive advantage. Kenya’s commercial banking sector faces such challenges, and though the sector has generally been performing well, there is difference in performance among the banks, with some banks reporting poor performance so far as profit before tax is concerned. This study evaluated the relationship between drivers of competitive advantage and the performance of commercial banks in Kenya. The drivers of competitive advantage studied were bank activities, bank activity drivers, initial conditions and managerial choice. The study also evaluated the moderating effect of dynamic capabilities on the relationship between drivers of competitive advantage and performance. The study was anchored on the Dynamic Capabilities Theory. Explanatory and cross sectional survey designs were employed in the study. The study explored all the 43 commercial banks. Data collection was carried out using a self–administered, semi-structured questionnaire for primary data, whereas secondary data was collected from Central Bank of Kenya website plus the commercial bank websites, with help of a designed tool. The study used descriptive statistics such as mean, standard deviation and percentages, to explain characteristics of data, while inferential statistics, mainly hierarchical multiple regression, were used to test the relationships between drivers of competitive advantage and bank performance. Tables and figures were used to present the results for ease of understanding and interpretation. Statistical package for social sciences (SPSS) was used for analysis. The study established the relationship between performance and bank activities, performance and bank activity drivers, as well as performance and managerial choices, to be positive and statistically significant. Dynamic capabilities were found to have a moderating
role between drivers of competitive advantage and performance. However, the study found that initial conditions do not have a significant relationship with performance of commercial banks in Kenya. The study recommends that the banking management lobby for the training of all bank staff on the role and application of the various categories of dynamic capabilities as well as on market volatility and the correct measures to be taken within their banks. The study also recommends that all staff be trained on customer service delivery and customer relationship. Management should also ensure robust training programs involving all their employees so as to uplift their intellectual capital.

FINANCIAL FLEXIBILITY AND CORPORATE INVESTMENT AMONG NON FINANCIAL COMPANIES LISTED ON NSE, KENYA

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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.
EFFECT OF PUBLIC DEBT ON ECONOMIC GROWTH IN KENYA

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

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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.

INFLUENCE OF MARKETING MIX DIMENSIONS ON PERFORMANCE OF SHOPPING MALLS IN NAIROBI CITY COUNTY KENYA.

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Department: Business Administration

Supervisors: Dr. Reuben Njuguna

Mr. Shadrack Bett

The retail sector in particular shopping malls forms a critical element of a community’s economic and social welfare. It provides shoppers with products variety, value for money, convenience and recreational services. However the sector is posed with challenges of intense competition and complex shoppers’ behavior. The purpose of the study was to establish the influence of marketing mix dimensions on performance of shopping malls. The specific objectives included seven marketing mix dimensions i.e. product, place, price and promotion, people, physical evidence and process which formed the independent variables. The shoppers’ purchase decision an output of consumer behavior was incorporated to take a moderating effects between the marketing mix dimensions and mall performance. The research examined nineteen shopping malls in Nairobi County however other malls were either under construction or had ceased operation at the time and after data collection. The target population was nineteen shopping malls and respondents consisted of marketing managers, tenants and shoppers. Census method was used in selecting malls and marketing manager. The study used stratified sampling design to determine the sample size and simple random sampling method to obtain the sample of respondents’ from shoppers and tenants. In conducting the research, primary data was collected through use of structured questionnaires. Descriptive and exploratory research design was used in the study. The data was analyzed through use of multiple regression analysis. The results of univariate linear regression showed significant linear relationship between Shopping Mall Performance each predictor variable at 95% confidence level. Each of the predictor variables results explained the variation in shopping mall performance. Multivariate linear regression
analysis was also conducted to predict shopping mall performance it was found that independent variables explained a significant amount of the variance in the shopping mall performance ($R^2 = .543, R^2_{\text{Adjusted}} = .521$). An $R^2$ value of .543 indicated that 54.3% of the variation in shopping mall performance could be explained by the regression model while other factors explained 45.7%. The value of Durbin Watson was above 1.5 (1.902) indicating that there was no serious problem of autocorrelation. To determine how best the regression model fitted the study data, analysis of variance on the coefficient of determination ($R^2$) was calculated. An F value of 25.583 ($P<.001$) showed that the model was suitable at 95% confidence level. The results showed that adding moderating effect of shoppers’ purchase decision to the model increased the number of significant coefficients among the predictor variables by one (Price Mix Dimension) and maintained the previous two predictors (Place Mix dimension and Process Mix Dimension). The independent variables explained a significant amount of the variance in the Shopping Mall Performance ($R^2 = .593, R^2_{\text{Adjusted}} = .549$). Thus including the moderating effect of Shoppers’ Purchase Decision to the model improved the amount of variation in Shopping Mall Performance by 5%. 


SCHOOL OF EDUCATION

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

LUCY NYAWIRA MACHARIA-Ph.D

Department: Educational Psychology

Supervisors: Dr. Tabitha Wang’eri

Dr. Jotham Dinga

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.

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

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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-Multiattributitional 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.

TEACHERS’ PREPAREDNESS IN INTEGRATING INFORMATION COMMUNICATION TECHNOLOGY IN TRAINING TEACHERS IN PUBLIC PRIMARY TEACHER TRAINING COLLEGES IN CENTRAL REGION KENYA

ALICE OMARIBA-Ph.D

Department: Educational Communication and Technology

Supervisors: Prof. Henry O.Ayot

Prof. Samson R.Ondigi

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.

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 Kinai

Dr. Dinga Jotham Ndolo

The purpose of the study was to find out how school type is related to self-esteem, academic achievement and career aspirations of secondary school students. Students’ admission into different school types is on the criteria of their KCPE marks. 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 trend is worrying and parents are concerned about the school type their children attend. Therefore, students over time have known differences between schools. Such 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. Form 4 public students were the target population. By the time of the study, there were 79 public secondary schools in Nairobi County (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, through simple random sampling, a sample of 40 students of one form 4 class was drawn (12x40=480 students). Correlation design was used in this study. Data was collected using questionnaires with standardized scales for students and class teachers. Pilot study was done to establish validity and reliability of the instruments and Cronbach alpha coefficient was used. Statistical Package for Social Sciences (SPSS) with descriptive and inferential statistical analysis was used. Chi-square tested differences in students’ self-esteem between school types. One way Analysis of Variance (ANOVA) and \( \chi^2 \) tested differences between students’ academic achievement and school type, and also differences in students’ career aspirations by school type. Analysis for gender differences in students’ self-esteem used t-test and \( \chi^2 \). ANOVA tested differences in self-esteem and career aspirations for boys and then for girls 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 significant relationship between school type and students’ self-esteem (\( \chi^2 (6) = 456.56, p = .00 \)), academic achievement (\( f (3,447) =151, p = 0.00 \)) and career aspirations (\( f (3,447) = 14.69, p =.00 \)). Majority 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. Students with high self-esteem 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.

**RELATIONSHIP AMONG PARENTING STYLES, LEARNER’S INVOLVEMENT IN BEHAVIOUR PROBLEMS AND ACADEMIC PERFORMANCE IN NAIROBI COUNTY, KENYA**

ONG’ERA LYNNET KEMUNTO-Ph.D

Department: Special Needs Education

Supervisors: Dr. Mary Runo

Dr. Geoffrey Karugu
There is abundant evidence to support the correlation between parenting styles, children’s behaviour disorders and academic performance. However, the relationship among parenting styles, learners’ involvement in problem behaviour and academic performance has received little attention and research interest in Kenya. The main purpose of this study was to determine the relationship among parenting styles, learners’ involvement in problem behaviour and academic performance in Nairobi County, Kenya. This research study used mixed method involving descriptive and correlational research designs. Quantitative data was collected from learners using questionnaires while qualitative data was collected from parents using interviews. The population of study was drawn from three randomly selected sub-counties of Nairobi County namely: Dagoretti, Lang’ata and Starehe. Fifteen schools were randomly selected from the three sub-counties. A total of 400 learners from regular public secondary schools and 40 parents were randomly selected for the study. This study sought to find out factors that influence parenting styles, establish the influence of parenting styles on learners’ involvement in behaviour problems, determine the influence of involvement in behaviour problems on learners’ academic performance and find out the relationship between parenting styles and learners’ academic performance. The theoretical model by Diana Baumrind, (1966) on parenting styles formed the basis of this study. Research instruments were piloted prior to the study in Kasarani Sub-County, Nairobi County using 13 respondents comprising of 10 learners and 3 parents. Reliability was tested using internal-consistency method. Research data was collected through questionnaires and interviews. Statistical Package for Social Sciences (SPSS) software was used to analyse quantitative data. Qualitative data was organized and analysed by themes. Descriptive and inferential statistics was used to summarize and describe the sample. Findings of the study revealed that learners of authoritative parents have low involvement in problem behaviour and
perform better academically as compared to learners of authoritarian, permissive and neglectful parents. It also revealed that involvement in problem behaviour is negatively correlated with academic performance and learners of neglectful parents rank low in academic performance as compared to learners of parents using other parenting styles. It is recommended that parents should strive to understand their children, know their friends, engage them with constructive activities and seek better ways of controlling what they access through media. Further, parents should purpose and dedicate quality time with their children, dialogue with them, listen to their concerns and address them effectively.

**EFFECTS OF PRACTICAL WORK ON STUDENTS’ ACHIEVEMENTS IN PHYSICS AT SECONDARY SCHOOL LEVEL IN MURANG’A EAST SUB-COUNTY, KENYA**

*MUCHAI AUGUSTINE NG’ETHE-Ph.D*

**Department: Educational Communication and Technology**

**Supervisors: Prof. Nicholas Twoli**

**Dr. David Khatete**

This study explored the effects of practical work on students’ achievements in Physics at secondary school level in Murang’a East Sub-County. The choice of this study was motivated by the declining number of students taking Physics at KCSE in Murang’a East Sub-County. The situation is dire to the extent that some schools do not even present a single candidate for Physics in KCSE. This is despite the fundamental role Physics as a science subject plays in the contribution of innovations and developments required to achieve vision 2030. This study was designed to investigate the effects of practical work in enhancing students’ achievements in Physics in Secondary schools in Murang’a East Sub-County. Specifically the study was set to achieve five objectives namely to examine the effects of practical work on students’ performance in Physics; to investigate the effects of practical work on students’ attitudinal change in Physics, to assess the influence of practical work in Physics on students’ acquisition of science process skills; to find out whether practical work in Physics has any influence in the number of students enrolling to take Physics in Form Three and to develop a scheme for evaluating practical work in Physics. The study targeted 9820 students in 31 public secondary schools of Murang’a East Sub-County. The study was a quasiexperimental design. It comprised four mixed secondary schools purposely sampled; two experimental groups and two control groups. The main units of analysis were the 188 Form 2 students of the four purposively
sampled mixed Day Secondary Schools. All the four groups were exposed to the pretest. The experimental groups were taught using the practical approach for one term while the control groups were taught using the traditional method. The study used four instruments namely: A pretest Physics Achievements Test, Physics Attitudinal scale, an Observation Checklist and post-test Physics Achievements test. At the beginning of the term, all the four groups sat for pre-test Physics Achievements test. They completed the Physics Attitude scale. They also sat for the post-test achievements test at the end of the term. An observation checklist for skills Acquisition (OCFSA) was used to assess the science process skills acquired by the students. The data obtained were analyzed using SPSS version 21. Student’s t-test was used to compare the mean of the experimental and control groups. The significance of the results was tested at α = .05 significance level. The results of the study showed that Practical Approach resulted in higher students’ achievements in Physics, lead to improved students’ attitude towards Physics and resulted in higher student enrolment in Physics at KCSE. This approach also resulted in improved students’ acquisition of science process skills. Finally, a prototype marking scheme for evaluating practical work in Physics was developed. The study concluded that, practical Instructional Approach towards Physics is an effective teaching method which Physics teachers should be encouraged to use to enhance students’ achievements in the subject. The study recommended adoption of the teaching approach and marking scheme in all schools in Kenya in order to boost students’ achievements, enhance acquisition of science process skills, improve students’ attitude towards the subject and increase thes

PARENTAL INVOLVEMENT AND STRATEGIES USED BY TEACHERS IN SUPPORTING CHILDREN’S TRANSITION FROM PRE-PRIMARY TO PRIMARY SCHOOL IN KIAMBU COUNTY, KENYA

MARGARET WANJIRU MWANGI – Ph.D

Department: Early Childhood Studies.

Supervisors: Dr. Gladwell Wambiri

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Early Childhood Education marks a transition phase between home and primary school, and is a major milestone to children, parents, and teachers. This phase is described as one of the major challenges children have to face in their early childhood years as they try to cope with a range of physical, social and academic challenges associated with the new school environment(s). Studies have found that thirty per cent of children who join Standard one drop-out of school as soon as they enter school due to transition related challenges. Studies done in Kenya have not adequately focused on establishing the transition strategies used by teachers in pre-primary and primary schools and how they involve parents in the transition process. A smooth transition should create a degree of continuity between pre-primary and primary school. This study was based on Bronfenbrenner’s Ecological Systems Theory. The purpose of this research was to establish the
transition strategies that are used by teachers in pre-primary and in primary schools and how parents are involved in supporting children’s transition from pre-primary to primary school. This study was mainly qualitative and therefore focused on meaning rather than establishing casual relationships. The study was carried out in Kiambu County. The sample size constituted 24 teachers, 12 primary school teachers, twelve 12 pre-primary school teachers who were obtained through Multiple Variation Sampling (MVS) and twelve 12 parents who were randomly sampled. Descriptive research design was used to collect data using interview schedules, observation checklists and focus group discussions. Data were analyzed both qualitatively and quantitatively. Qualitative data was analyzed using the five steps proposed by LeCompe (1999) and thematic analysis based on Spradley’s semantic relationships. Quantitative data was analyzed using tables. It was established that pre-primary and primary school teachers used appropriate strategies such as child-centered teaching methods, DAC, and allowing children to visit primary school. In addition, inappropriate transition strategies that were identified included, teaching Standard one curriculum content and assisting children pass Standard one ‘interview’. Strategies that were used by primary school teachers included, sharing information about children’s performance, planning extra-curriculum activities with pre-primary school teachers and asking for progress records. It was also established that inter-staff communication between pre-primary and primary school teachers was rarely practiced. The study also found that parents were less involved in their children’s transition to primary school. The study recommends strengthening of collaboration among pre-primary and primary school teachers, pre-primary school teachers and parents, and primary school teachers and parents. In addition, teacher to child ratio should be reduced to ensure there are intensive and interactive class activities. Teachers should be empowered through in-service training in order to improve on their teaching methods. The government should invest more on the lower primary school as well as preschool since they give firm foundation for future successes.

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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Department: Educational Management, Policy and Curriculum Studies

Supervisors: Prof. Grace W. Bunyi

Dr. George A. Onyang

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.
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 of special education teachers in Southern Ghana. The study 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

PHILO THERE NTAWIHA-Ph.D

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Supervisors: Dr. Mary A. Otieno
Dr. Levi Libese

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.
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, \((r = .568, p = < .000, \text{ with a } R^2 = 92.516)\). On the other hand, there was no statistically significant correlation between parents’ age \((r = .126, p = < .234, \text{ with a } R^2 = 13.69)\), gender \((r = .176, p = < .091, \text{ with a } R^2 = 11.28)\) and preferences on preschool education. 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.

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

**CHEBET CATHERINE MUTAI-M.Ed**

**Department:** Educational Communication and Technology

**Supervisors:** Dr.Miheso O’Connor

**Prof.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.

PERCEPTIONS OF LEARNERS ON TEACHING-LEARNING PROCESSES AND THEIR ACADEMIC PERFORMANCE IN SELECTED PRIMARY SCHOOLS FOR THE HEARING IMPAIRED IN UASIN GISHU COUNTY, KENYA

EVELYNE N. PWOKAH-M.Ed

Department: Special Needs Education

Supervisors: Dr. Bunyasi Beatrice Awori

Prof. John A. Orodho

The purpose of the study was to examine perceptions of learners with hearing impairment (HI) on their teaching-learning process and how their perceptions influence their academic performance in primary schools for the HI in Uasin Gishu County. The target population comprised of 153 learners in the one primary school and units for HI in the county. The only one fully fledged primary school for learners with HI was purposively selected while the units were
selected basing on the 30% formula of sampling provided by Mugenda and Mugenda, (2003). Therefore, two units were randomly selected (Kandie and Kamagut). The respondents were selected from the upper classes (Class Six, Seven and Eight). Pupils in these classes were considered knowledgeable enough to comprehend the requirements of the research tool. There were 68 pupils in Classes Six, Seven and Eight in Eldoret School for the Deaf and 14 pupils in the same classes in Kandie and Kamagut units. Therefore, a total of 82 pupils constituted the sample of learners. Questionnaire was the main data collection tool. Data collected were coded and entered into Statistic Packages for Social Sciences (SPSS). Frequency distribution tables were generated to show the frequencies of participants on each variable. The relation between the students’ perception of the teaching-learning process and the subsequent influence on academic performance was computed to give the inferential statistic index using Chi-square correlation coefficient. One way ANOVA was also computed to test if the use of instructional materials influence on academic performance of learners with HI differed in the selected primary schools. Findings were presented in pie charts, bar graphs and cross- tabulations. The results of the study revealed that academic performance of learners with HI in the sampled schools was generally below average with an overall mean score of 34.18% for the five examinable subjects. When Chi square correlation coefficient was computed to determine the measure of association between learners’ perception of teacher-pupil interaction and academic performance, a significant relationship was found ($\chi^2 (3, N= 70) = .789, p= 0.003$). Besides, a Chi square Correlation coefficient computed to determine the measure of association between learners’ perception of teachers’ use of instructional time and academic performance yielded a significant relationship ($\chi^2 (3, N= 70) = 0.815, p= 0.001$). Further, a Chi square Correlation coefficient computed to determine the measure of association between learners’ perception of teachers’ use of instructional materials and academic performance yielded a significant relationship ($\chi^2 (3, N= 70) = 0.721, p= 0.005$). Besides, a One way ANOVA which was computed to test if the use of instructional materials influence on academic performance of learners with HI differed in the selected primary schools found no significant difference in the use of instructional materials and academic performance in the selected schools ($F$-value was found to be significant at $> = 0.05, F=1.157, = .317 > 0.05$). It is recommended that: efforts should be made by the quality assurance and standard division in the Ministry of Education in organizing for relevant in-service programmes for all teachers and headteachers in the special schools where they can be enlightened and sensitized on communication approaches, sign language and even instructional materials; teachers should provide opportunities for learners in class and support to pupils with hearing impairments to enable them participate in the teaching and learning process in a bid to create healthier teacher-pupil interactions and enhance learners’ academic performance; headteachers should organize sign language workshops and lesson presentations at school level to assist the teachers in the teaching and hearing process as well as in class time management in a bid to enhance academic performance of learners with HI; and, teachers need to employ more of the instructional materials to keep the pace with their hearing counterparts in regular schools.
The aim of this study was to analyse predictors of behaviour change among children at risk in juvenile rehabilitation centres within Nairobi County, Kenya. The target population was all the children and managers of Juvenile rehabilitation Centres in Nairobi County. This consisted of 380 boys, 160 girls, 8 managers in Kabete and Getathuru and 4 managers in Dagorreti rehabilitation Centre, all making a total of 552 respondents. Children at risk in Juvenile rehabilitation Centres within Nairobi County were sampled using probability and non-probability sampling techniques. To obtain a manageable sample from the target population, convenience, purposive, stratified random and systematic random sampling techniques were used respectively. Questionnaires, interview schedules and focus groups were used in the study as tools for data collection. Data collected was entered, coded and analyzed using inferential statistics and SPSS. The qualitative data was organized, analyzed and reported into emerging themes. The study found out that rehabilitation of children at risk in Juvenile rehabilitation Centres was not adequately addressed and it was only those children with severe and profound cases whose misbehaviours transformed to moderate levels. Educationists were left out during assessment, classification, referral and exit stages despite their rich expertise in rehabilitation. The analysis of programmes applied scored below average in terms of behaviour change. Among the predictors, Special needs intervention
measures did not exist irrespective of the fact that more than ninety percent of children had special cases. Environment was not barrier free with transitional programmes being inadequate while majority of the staff were untrained in professional courses regarding behaviour change. The researcher recommended a multidisciplinary team in Educational Assessment and Referral Centres before entry into the regular schools. That all the staff should undergo a training in Special Needs Education and the Centres be placed under the Ministry of Education which has adequate personnel required to rehabilitate a child.

SCHOOL BASED FACTORS AFFECTING LEARNING OF KENYAN SIGN LANGUAGE IN PRIMARY SCHOOLS FOR HEARING IMPAIRED IN EMBU AND ISIOLO COUNTIES, KENYA

RWAIMBA MUTHOMI SAMUEL-M.Ed

Department: Special Needs Education
Supervisors: Dr. Franscah Irangi Wamocho
Dr. Beatrice Bunyasi Awori

This was a descriptive survey study design which sought to establish the school based factors that affect the learning of KSL in primary schools for learners with HI in Embu and Isiolo counties in Kenya. The target population was all teachers (29) teaching in Isiolo and St. Lukes primary schools for learners with hearing impairment, which were the only schools for learners with HI in Isiolo and Embu counties. From the selected schools, the study purposively and randomly sampled 2 head teachers and 8 teachers. Interview guides were used to obtain data from the head teachers, questionnaires from teachers while observation schedules were used to obtain data on the general nature of the school environment. Using descriptive statistics, quantitative were analyzed and tabulated in pie charts, frequency tables and bar charts while qualitative data were analyzed and presented in narrative form. The study findings revealed that; school infrastructure had a direct impact to the academic achievement of learners, teachers made use of curriculum instructional materials such as KSL dictionaries, charts and KSL texts books to teach KSL although the researcher’s observation indicated inadequacy of these resources, all the sampled respondents had training in special needs education but only 25% had training in KSL as a subject and finally the findings also revealed that the school management had a bearing effect on the learning of KSL among learners with HI. Basing on the findings the researcher recommends that the government through the MoE should increase the funding of these schools in order for them to have the adequate resources required, to put up and maintain good quality and adequate infrastructure, teachers teaching KSL should move further and make use of audio visual curriculum materials such as TVs and computers instead of only relying on the KSL dictionaries, charts and books. On the academic training of the KSL teachers, the TSC should post teachers trained in KSL to teach KSL among learners with HI and the universities should also introduce KSL as a teaching subject alongside other subjects like Mathematics, English,
Kiswahili and the like. The researcher further recommends for the training of all stakeholders in education management since training the heads alone is not sufficient because school management is a team effort.

ANALYSIS OF TEACHERS’ REMEDIAL STRATEGIES FOR ENHANCING MATHEMATICS SKILLS TO LEARNERS WITH DYSCALCULIA IN REGULAR PRIMARY SCHOOLS IN NYANDARUA COUNTY, KENYA

DANIEL GACHIHI TUCHURA-M.Ed

Department: Special Needs Education

Supervisors: Dr. Jessina Muthee

Dr. Joel Chomba

The aim of this study was to analyse remedial strategies used by teachers for enhancing mathematics skills to learners with dyscalculia in class four in Nyandarua North Sub-County which is in Nyandarua County, Kenya. The study employed a descriptive research design which used mixed model research with both qualitative and quantitative approaches. The researcher used questionnaires and observation schedule to carry out the study. Pilot study was done in Subuku, Kahindu and Olbolossat Primary Schools in Nyandarua North Sub-county. Population for the main study was drawn from Nyandarua North Sub-County in Nyandarua County. Sample size comprised 20 class four mathematics teachers and 20 head teachers, making a total of 40 respondents. Purposive sampling was used to select mathematics teachers for class 4 and head-teachers of the respective schools. In case a school had double or multiple streams, simple random sampling was used to get one teacher per school. Data from the research instruments was coded and analysed by electronic means using Statistical Package for Social Sciences (SPSS) to attain descriptive statistics. The findings are presented in frequencies, percentages, mean, standard deviation, tables, graphs and pie charts. The study found that head teachers and teachers had their various ways of identifying learners with learning disabilities based on their own criteria. The study also found that though majority of teachers were professionally qualified as teachers, most of them were not competent enough to support learners with dyscalculia. The study further found that most of the schools did not have adequate and suitable resources to support learners with dyscalculia. From the findings, the study recommended the curriculum developers to adapt curriculum in teacher training colleges whereby more emphasis should be directed on areas of special educational needs, in-service training on Special Needs Education should be enforced to teachers who have not trained in the area of special educational needs, seminars and workshop should be held regularly to update teachers on current instructional strategies and finally, government and other stakeholders should provide enough funds to purchase teaching and learning resources suitable for learners with mathematics disabilities.
CONTRIBUTIONS OF HEALTH EDUCATION TO ORAL HEALTH PRACTICES AMONG PHYSICALLY CHALLENGED PUPILS IN PUBLIC SPECIAL PRIMARY SCHOOLS IN KISUMU COUNTY, KENYA

OTIENO KENNEDY BRISKLEY-M.Ed

**Department:** Educational Foundations

**Supervisors:** Prof. James E. Otiende

Dr. Violet Wawire

The purpose of this study was to establish the contributions of Health Education (HE) to Oral Health Practices (OHP) among the Physically Challenged Pupils (PCPs) in Public Special Primary Schools (PSPS) in Kisumu County, Kenya. The objectives were to; determine oral health practices among the PCPs who study HE in PSPS, establish contributions of HE to Oral Health Practices among PCPs in PSPS, identify Oral Health (OH) challenges faced by PCPs who study HE in PSPS and to determine HE strategies put in place by the PSPS to address challenges in OHP among the PCPs. The study was guided by a theoretical framework adapted from Albert Bandura’s (1978) Social Learning Theory (SLT) and a conceptual framework showing the relationship between oral health contents in the primary school HE unit, intervening factors and identified oral health practices. Descriptive survey research design was adopted. Target population comprised of 925 people; 790 PCPs, 40 teachers, 87 parents and 8 caregivers drawn from 5 PSPS for Physically Challenged Pupils in Kisumu County, Kenya. Purposive Sampling technique was used to select 83 PCPs, 29 class teachers and 9 parents. All the caregivers participated in the study due to their small population. Data collection instruments included; FGD guidelines, a questionnaire, structured interview schedules and a customised journal. Validity of instruments was ascertained by experts from the Department of Educational Foundations at Kenyatta University. Piloting study was done among 37 pupils, 2 parents, 4 class teachers and one caregiver using test-retest method. Reliability coefficient index of 0.9 was obtained showing that the instruments were reliable. Data was analyzed using quantitative and qualitative statistical methods. The findings revealed that the most frequent OH practices included tooth brushing (80.47% responses) and rinsing the mouth with water at least once per day (85.22% responses) among the PCPs. The least performed practice was visit to dentist (5.42% responses) despite higher occurrences of tooth pain (43.35% responses). It was found that teacher centred HE lessons denied PCPs opportunity to practice learnt skills. Challenges found include; inadequate time for OH practices, lack of supervision and negative attitude towards OH care. Strategies to reduce challenges included; clear rules, organised OH talks and solicited donations of OH care items. The study concluded that; severity of disability limited
operationalization of knowledge and skills besides compounding negative attitudes of the PCPs towards OH practices taught. However, it was evident that HEC content had relevant information which contributed to the improved oral health practices among PCPs as they progressed from class 7 to 8. The study recommends that teachers should be in-serviced on HE content and the course be a core unit for trainees. Lastly the government should provide adapted OH facilities like toothbrushes to PCP as routine OH examinations are organised by the PSPS.

STRATEGIES OF TEACHING ENGLISH VOCABULARY FOR WRITING COMPOSITION IN STANDARD SEVEN IN PUBLIC PRIMARY SCHOOLS, THIKA SUB-COUNTY, KENYA.

KIARII JANE WAMBUI-M.Ed

Department: Educational Communication and Technology

Supervisors: PROF. HENRY O. AYOT

DR. SOPHIA M. NDETHIU

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.

EFFECTS OF KENYAN SIGN LANGUAGE ON ACQUISITION OF ENGLISH LANGUAGE: A STUDY OF ESAGERI SCHOOL FOR THE DEAF, MOGOTIO, BARINGO COUNTY, KENYA

ABEL KILANYA-M.Ed

Department: Special Needs Education

Supervisors: Dr. Beatrice Bunyasi Awori

Prof. Gathogo Mukuria

The aim of the study was to analyze Kenyan Sign Language (KSL) on acquisition of English language. Kenyan Sign Language is considered the natural language of the deaf in Kenya. Teachers in deaf schools are encouraged to use KSL when teaching general subjects and a form of signed English when teaching English. Currently, KSL is placed at the same level with English and Kiswahili languages. The government according to the constitution respect, promote and protect the diversity of languages of her people, this includes KSL. The research objectives were; to find out KSL and English language grammatical structures establish the influence of KSL on acquisition of English language, determine teachers’ ability to cope with the integration of KSL and English language and assess implication of KSL on acquisition of English language. The purpose of the study was to analyze how the use of Kenyan Sign Language is affecting the acquisition of English language. The significance of the study was to promote better understanding of the linguistic needs of the learners with hearing impairments. The study was carried out at Esageri School for the Deaf in Mogotio Sub-County, Baringo County and delimited to learners with HI, schools principal and teachers of the school. The researcher
adopted Vygotsky socio-cultural theory, who has laid the foundation for the interactionist view of language acquisition. A pilot study was carried out to establish validity and reliability of the research instruments in Iten School for the Deaf in Elgeyo Marakwet County before the actual collection of data for the main study. The researcher used questionnaires, observation checklist and interview guide. These instruments comprised open-ended and closed-ended questions. The study used both qualitative and quantitative research approaches. The researcher gathered information, summarized, presented and interpreted data for the purpose of clarification. The study used both purposive and stratified simple random sampling technique to obtain the study sample. The study had a sample of 35 persons, which includes schools principal, teachers and pupils. Responses collected from the questionnaires, observation checklist and interview guides were coded, quantified, categorized to generate data for analysis using Statistical Package for Social Sciences (SPSS). Findings were presented in form of tables, pie charts bar graphs and histograms, qualitative data described according to the themes of the study. The findings for the study were to promote a better understanding of linguistic needs of learners with HI with a view to helping them acquire parity with their hearing counterparts since both go through the same systems of education and sit for the same examinations. The study showed that KSL has different grammatical structures from that of English language and its introduction had not boosted learning in schools for the learners with HI and this could limit employment opportunities among the deaf persons in Kenya. The researcher recommended that more teachers should be trained in KSL to equip them with adequate skills for effective teaching of KSL and English language. Further research should be carried out to determine the relationship between signs and mastery of the content among learners with hearing impairments in Kenya.

TEACHERS PERCEPTION TOWARDS HEAD TEACHERS INSTRUCTIONAL SUPERVISING 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 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.

STRATEGIES OF TEACHING ENGLISH VOCABULARY FOR WRITING COMPOSITION IN STANDARD SEVEN IN PUBLIC PRIMARY SCHOOLS, THIKA SUB-COUNTY, KENYA.

KIARIJANE WAMBUI-M.Ed

Department: Educational Communication and Technology

Supervisors: PROF. HENRY O. AYOT
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.
PEDAGOGICAL FACTORS AFFECTING THE LEARNING OF TRIGONOMETRY IN SECONDARY SCHOOLS IN GATUNDU NORTH SUB-COUNTY, KIAMBU COUNTY, KENYA

Daniel Gathihi Kagenyi-M.Ed

Department: Educational Communication and Technology

Supervisors: Dr. Simon Rukangu

Dr. Wilson Kerich

Trigonometry topics are very important in mathematics education as trigonometric functions have many applications in fields such as adverse physics, mechanical and electrical engineering, music, astronomy and biology. Any challenges encountered by students in learning affect overall performance in the subject. The purpose of the study was to determine the pedagogical factors affecting learning of the topic in secondary schools and recommendation made. The objectives of the study were: To determine the teaching methods applied that enhance students’ participation, the use of instructional resources available and adequacy, students’ attitude toward the topic, challenges encountered by students when learning and kind of classroom interaction patterns. The study was descriptive statistical survey focusing on F3 students and their mathematics teachers. Stratified sampling technique was used to select the 7 secondary schools from the three categories of the 27 schools in the district. Simple random sampling was used to select a F3 stream where there were more than one stream. Otherwise it was purposively selected. Data was collected using the instruments: Mathematics teachers’ questionnaire, Mathematics students’ questionnaire, Head of mathematics interview schedule and Flanders Interaction Analysis Categories. The Reliability and Validity was done using Test-Retest method during piloting on two different schools which were not used for research actual data collection within time frame of two weeks. The correlation coefficient was 0.85 positive. Data from the questionnaires and classroom observation were analyzed both qualitatively and quantitatively. Qualitative analysis was involved in making inferences from open ended response questions. Quantitative analysis involved descriptive statistics indicating the factors affecting the learning of trigonometry by students. Results of the study findings indicated that teachers were not using teaching methods that encourage students’ participation as indicated by 50% of respondents who preferred using lecture and demonstration compared 7% for discussion, the instruction resources were inadequate as indicated by 34% of students, students had negative attitude towards the topic as indicated by 71.4%. The main challenges encountered by students when drawing graphs were lack of understanding of the concept and failure to choose a suitable scale. The teachers’ dominated classroom interaction pattern taking two thirds of the lesson and hence limiting students’ participation. Recommendation: Teachers should integrate both expository and heuristic
approaches thus increase students’ active participation in teaching and learning. SMASSE activities need to be incorporated in the learning process. Students need both intrinsic and extrinsic motivation to help them change their attitude. School administrators should be ensuring the instructional resources for students are readily available and adequate. If the above recommendation can be implemented there will be improved performance in trigonometry topic and hence overall performance in mathematics at KCSE level.

INFLUENCE OF 5-8 YEAR OLD CHILDREN’S AGGRESSIVE BEHAVIOURS ON THEIR EDUCATIONAL PROGRESS IN MWINGI CENTRAL DISTRICT, KITUI COUNTY KENYA

ALEX LUSWETI WALUMOLI-M.Ed

Department: Early Childhood Studies

Supervisors: Dr.Rachael Kamau Kang’ethe
Dr.Maureen Mweru

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 modelling and 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.

DETERMINANTS OF STANDARD ONE PUPILS’ READINESS TO LEARN MATHEMATICS IN PRIMARY SCHOOLS IN KASARANI SUB-COUNTY, KENYA

PHYLLIS M. MAGOMA-M.Ed

Department: Early Childhood Studies

Supervisors: Dr. Teresa Mwoma
Dr. Esther Waithaka

Research has shown that when children enter school ready to learn, they perform better. Readiness for school would help to reduce repetition and school dropout rates in primary schools. The purpose of this study was to establish pupils’ readiness to learn mathematics at the start of primary school. The study was guided by Ecological Theory by Urie Bronfenbrenner. The theory was selected for this study because it is suitable in understanding school readiness processes and contextual elements related to preparing children for school. Correlation research design was used in the study. The dependent variable was pupils’ readiness to learn mathematics. The independent variables were: Pupils’ school entrance age; gender of pupils; type of pre-primary school pupils attended, and parents’ level of education. The target population was standard one pupils enrolled in primary schools in Kasarani sub-county. Purposive sampling was used to select Kasarani sub-county and standard one pupils. Stratified random sampling was used to select 15% (12) primary schools to be involved in the study. The sample of the study consisted of 15% (123) class one pupils, 248 parents, and 12 class one teachers. Pupils’ readiness to learn mathematics check-list and questionnaire for teachers and parents were used to collect data. The researcher pre-tested the instruments in two primary schools, one public and the other private which were excluded in the final study. Content validity (item analysis) was used to test the validity of the instruments, while Guttman split-half test was used to test the reliability of the instruments which was found to be 0.85. Descriptive statistics involving frequencies, percentages and means were calculated. The inferential statistics used were Chi-square and t-test. Results from data analysis were presented using tables and were organized according to objectives and hypotheses of the study. The results showed that more than 25% of the pupils were not ready to learn mathematics and girls were more ready to learn mathematics than boys. However, the difference in pupils’ readiness to learn mathematics between boys and girls was not significant at
p<0.05 level of significance. On the other hand, the relationship between pupils’ family economic class; pupils’ school entrance age; parents’ level of education; type of pre-primary school attended and pupils’ readiness to learn mathematics was significant at 0.05 level. It was recommended that school management should fully comply with education policies by not admitting pupils who are underage. Pre-primary school teachers specifically those in public primary schools should regularly assess children’s readiness to learn mathematics so as to enable them to identify pupils with difficulties in mathematics.

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

Dr. Francis Wokabi

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.

ANALYSIS OF TEACHERS’ REMEDIAL STRATEGIES FOR ENHANCING MATHEMATICS SKILLS TO LEARNERS WITH DYSCALCULIA IN REGULAR PRIMARY SCHOOLS IN NYANDARUA COUNTY, KENYA

DANIEL GACHIHI TUCHURA –M.Ed

Department: Special Needs Education

Supervisors: Dr. Jessina Muthee

Dr. Joel M. Chomba

The aim of this study was to analyse remedial strategies used by teachers for enhancing mathematics skills to learners with dyscalculia in class four in Nyandarua North Sub-County which is in Nyandarua County, Kenya. The study employed a descriptive research design which used mixed model research with both qualitative and quantitative approaches. The researcher used questionnaires and observation schedule to carry out the study. Pilot study was done in Subuku, Kahindu and Olbolossat Primary Schools in Nyandarua North Sub-county. Population for the main study was drawn from Nyandarua North Sub-County in Nyandarua County. Sample size comprised 20 class four mathematics teachers and 20 head teachers, making a total of 40 respondents. Purposive sampling was used to select mathematics teachers for class 4 and head-teachers of the respective schools. In case a school had double or multiple streams, simple random sampling was used to get one teacher per school. Data from the research instruments was coded and analysed by electronic means using Statistical Package for Social Sciences (SPSS) to attain descriptive statistics. The findings are presented in frequencies, percentages, mean, standard deviation, tables, graphs and pie charts. The study found that head teachers and teachers had their various ways of identifying learners with learning disabilities based on their own criteria. The study also found that though majority of teachers were professionally qualified as teachers, most of them were not competent enough to support learners with dyscalculia. The study further found that most of the schools did not have adequate and suitable resources to support learners with dyscalculia. From the findings, the study recommended the curriculum developers to adapt curriculum in teacher training colleges whereby more emphasis should be directed on areas of special educational needs, in-service training on Special Needs Education should be enforced to teachers who have not trained in the area of special educational needs, seminars and workshop should be held regularly to update teachers on current instructional
strategies and finally, government and other stakeholders should provide enough funds to purchase teaching and learning resources suitable for learners with mathematics disabilities.

AVAILABILITY AND USE OF COMMUNITY RESOURCES FOR TEACHING BUSINESS STUDIES IN SECONDARY SCHOOLS IN RUIRU DISTRICT KIAMBU COUNTY, KENYA

OBADIAH PAMELA KERUBO-M.Ed

**Department:** Educational and Communication Technology
**Supervisors:** Dr. W. Kerich.

Dr. D. Oludhe

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.

INTEGRATING INFORMATION COMMUNICATION AND TECHNOLOGY IN MATHEMATICS EDUCATION AT SECONDARY LEVEL, A CASE OF NAIROBI COUNTY, KENYA

AMUKO OYEILA SHEILA-M.Ed

**Department:** Educational Communication and Technology,
**Supervisors:** Dr. Miheso O’connor

Dr. Sophia M. Ndethiu

The purpose of this study was to explore the various challenges and opportunities influencing integration of ICT in teaching and learning Mathematics in secondary schools in Nairobi County. The study sought to: Determine the levels of ICT integration in teaching and learning
Mathematics; identify the challenges and opportunities of ICT use in teaching and learning Mathematics; and identify best pedagogical practices used in teaching Mathematics using ICT. The study adopted Rogers’s diffusion theory, whereby the user or adopter is critical in the whole process. The study, adopted a descriptive survey research design hence data were largely descriptive in nature. Three instruments were used to determine the results in the study: teachers and student questionnaires’, a structured interview schedule for the deputy heads of department and an observation checklist. The study was carried out in twelve public secondary schools in Nairobi County. The schools included three National schools and nine County schools. The study adopted purposive sampling to select teachers, while simple random sampling to select schools, deputy principals and Form Three students. The sample comprised two hundred and ninety nine (299) respondents. The sample of the study included twelve secondary schools, twelve Mathematics teachers, two hundred and seventy five (275) form three students and twelve heads of Mathematics department. Data analysis was done using Statistical Package for Social Sciences (SPSS) version 20, which involved the use of percentages and frequency tables. The findings indicated that there were low levels of ICT integration; Mathematics teachers are not well prepared to integrate ICT in teaching Mathematics. The study concluded that, despite, the major challenges faced by teachers, they are expected to develop their technological skills and knowledge as well as use ICTs in their teaching. This study recommends that students be allowed to use smartphones for learning purpose only and teachers to be trained on how to integrate ICT in teaching and learning Mathematics during their pre-service course and in-service practice.

STRATEGIES OF EARLY INTERVENTIONS ON ACADEMIC PERFORMANCE OF LEARNERS WITH PHYSICAL DISABILITIES IN PRIMARY AND SECONDARY SCHOOLS IN TWO SELECTED DISTRICTS, RWANDA

JEAN TWAGIRIMANA-M.Ed

Department: Special Needs Education

Supervisors: Dr. Nelly W. Otube
Dr. Franciscah I. Wamocho

The purpose of this study was to determine the strategies of early intervention on academic performance of learners with physical disabilities in special primary and secondary schools in Nyanza and Huye Districts in Southern Province of Rwanda. The study was guided by social learning theory. Descriptive survey research was used to find out teacher professional education level in providing EI in SNE, to determine EI strategies used by teachers at early childhood level and to identify materials used for providing EI in instructions. The target population of parents, learners and teachers was 1,673. The number of learners with physical disabilities was 1364 in primary and secondary levels. 86 and 223 parents. A sample size of 10 teachers from primary, 10 teachers from secondary, 25 learners from primary, 45 learners from secondary and 6 parents were selected for learners of primary and 6 parents for learners of secondary which gave a total of 102 respondents. In the study purposive and simple sampling techniques were used to select
teachers and parents while stratified sampling was used in selecting learners. The sample was drawn from two selected special schools for learners with physical disabilities with their teachers and parents. Four instruments: questionnaires, interview guide, focus group discussion and observation checklists were used to collect data on the strategies of early intervention on academic performance of learners with physical disabilities. The pilot study pre-tested to two schools of selected districts for learners, teachers in ordinal levels and for home mates of learners used as guardians. Descriptive statistics was used to present and analyse the results of the study. Findings showed that professional background was good enough for the teachers to generate informed data but it was noted that educational programs were not delivered as effectively as expected because of the big number of teachers not qualified in the area of SNE. It was also noted that early interventions weren’t provided as well due to the lack of experts in that area. The Ministry of Education should provide funds for organizing seminars and workshops in the area of the SNE to improve the number of teachers’ qualification to be able to teach effectively and the policy would be implemented from the parents in terms of team collaboration to raise the services of infants and toddlers with physical disabilities.

ENVIRONMENTAL INFLUENCES ON ENGLISH LANGUAGE ACQUISITION AMONG CLASS FIVE LEARNERS WITH HEARING IMPAIRMENTS IN NAIROBI COUNTY, KENYA

MUNAGI ISAAC MWANGI-M.Ed

Department: Special Needs Education

Supervisors: Dr. Mary Runo

Prof. Geoffrey Karugu

The study looked at Environmental Influences on English language acquisition among class five learners with hearing impairments in Nairobi County, Kenya. Majority of learners with hearing impairments in Kenya seem to leave school without having attained adequate literacy levels deemed desirable for successful transition in the afterlife of school. Factors such as inadequate
resources in schools, poor teaching methodology and poor parental support are some of the factors that make learners with hearing impairments have poor acquisition of English language. The study was guided by four objectives which included: i) to investigate the teaching methodologies used in teaching English language for learners with hearing impairments, ii) to explore the learning resources that aid English language acquisition for learners with hearing impairments, iii) to examine the level of English language acquisition for the learners with hearing impairments and iv) to explore the parental support that aid English language acquisition for learners with hearing impairments. Both qualitative and quantitative research methods were employed in the study. Purposeful sampling was used to select the special units to carry out the research. It was also used to sample the teachers who taught the learners with hearing impairments, learners and also their parents. Closed ended questionnaires were used to solicit information from the teachers while focus group discussion guide was used to conduct a focused group discussion with parents of learners with hearing impairments. A teacher informal test was used to assess the level of English language acquisition for the learners with hearing impairments. The study findings indicated that there were gaps in the teaching methodology for learners with hearing impairments such as inadequate use of prereading, sign bilingualism and oral methods among others. Furthermore, the findings reveal that the schools with the special units lacked adequate resources for teaching English language for learners with hearing impairments. One of the key recommendations in the research study pointed out that teachers needed a refresher course in order to execute the latest teaching approaches for learners with hearing impairments.
THE ROLE OF PICTURES IN TEACHING ENGLISH COMPOSITION WRITING IN UPPER PRIMARY SCHOOL IN EMUHAYA SUBCOUNTY, VIHIGA COUNTY, KENYA.

PAMELA KALEMESI JUMBA-M.Ed

Department: Educational Communication and Technolog

Supervisors: Dr. Adelheid Bwire

Dr. Samson Ondigi

Instruction using a variety of learning resources has been heralded as a most promising activity that can engage students into academic language and literacy skills. However, research on picture based instruction in English composition teaching is minimal. This study sought to establish the role of pictures and its effect on composition writing and language achievement in upper primary schools. This study was based on constructivism theory with two proponents, Jean Piaget and Vygotsky. Two categories of schools were selected; public and private. The sample population was about 10% of learners in Emuhaya Sub-county, who constituted upper primary pupils from six schools, twelve English panel leaders (teachers) and two Quality Assurance and Standards Officers (QASO). The sample population constituted class seven pupils of the six schools. The learners were twenty per group, within the age group of 11-14 years. The research methodology employed in the study was an experimental design. The experimental groups received the treatment with the use of pictures, whereas the comparison group was taught conventionally. Four instruments that were used in this study were questionnaire, tests, interviews and observation schedules. This study was piloted to establish whether the instruments were valid and reliable before the actual study. The data was analyzed using SPSS software package version 21. From the study, there was significant difference (p=0.001) among groups where there was use of pictures and the controls. Basing on the findings of the study, it was established that teachers rarely taught composition using pictures due to the short preparation time and therefore this lowered performance in composition writing. This study recommends a similar study on the use of pictures in middle primary school to compare the results. It also recommends a study on the adequacy and appropriacy of texts used by teachers in teaching English Composition. Lastly a similar study should be carried out for a longer period of time.
Members of the society require science skills to cope with technologically-changing world. Despite this realization, the performance in science subjects is still below the required standards worldwide. The impetus to conduct this study stemmed from the fact that science education plays a significant role in a child’s development as it can bridge the gap in education achievement in science performance at higher levels of learning. The purpose of this study was to investigate the determinants of early childhood teachers’ use of inquiry based instructional approaches in science activities. The main objectives of this study were to: establish the extent to which teachers used inquiry based instructional approaches in teaching science in early childhood development education, investigate the extent to which teachers’ level of training influences use of inquiry based instructional approaches in teaching science in early childhood development education, determine the extent to which the type of training institution influences use of inquiry based instructional approaches in teaching science in early childhood development education and examine the extent to which teaching experience influences use of inquiry based instructional approaches in teaching science in early childhood development education. The target population for this study was 270 teachers. Eighteen teachers were purposively selected to take part in the study. The instruments for data collection were phenomenological interview and science lesson observation schedules. Interview questions were pretested on two teachers from Maara Sub County. Credibility of the study instruments was established through member check, prolonged engagement, persistent observation, peer debriefing, triangulation, multiple data sources and by comparing pretest results from the pilot study in two districts. The reliability of the study instruments was ensured by keeping accurate descriptions and interpretations of respondent experiences and corroboration of the data by participants at all stages of the research process. This study adopted in-depth phenomenological interviewing of participants for 30 minutes. The
researcher randomly selected and observed three separate science lessons taught by each teacher in the study sample. Descriptive statistics including frequency counts and percentages were used to summarize and organize quantitative data while data elicited by interview questions and observation were analyzed qualitatively using content analysis. The responses were thematically discussed. The study found that there was limited use of inquiry-based instruction in science teaching. The result shows that the teacher’s level of training, type of training institution and teaching experience had no significant influence on teachers’ use of IBI. This study concluded that teachers were currently practicing inquiry-based instruction and that the level of training, experience and type of training institution did not significantly bring about differences in the use of inquiry-based instructional approaches. The recommendations from this study are that the Government should prioritize the allocation of instructional resources to promote the practice of inquiry-based learning. This study recommends training of teachers on the use of inquiry-based learning approaches in pre-primary schools.

THE RELATIONSHIP BETWEEN SCHOOL FEEDING PROGRAMMES AND SCHOOL ATTENDANCE AND ENROLMENT AMONG PRE-SCHOOL CHILDREN IN CHEPALUNGU SUB-COUNTY, BOMET COUNTY, KENYA

CHELANGAT CAROLINE – M.Ed

Department: Early Childhood Studies.

Supervisors: Rachel W Kamau-Kangethe
Dr. Teresa Mwoma

Feeding programme may not increase food intake of targeted individuals by 100 percent, but is provided to improve food consumption, encourage school attendance, enrolment and learning. The provision of School Feeding Programme (SFP) also may result in saving health care cost among children. Despite the benefits that may be obtained from SFP, it is not easy to administer and not provided in all pre-schools. In Kenya, the implementation process of SFP has not yet been effectively carried out. According to the new constitution, Early Childhood Development and Education (ECDE) is under the management of County Governments, but little has been
done in the provision of ECDE services, SFP included. The Programme faces challenges like lack of parental support, inadequate funding and skilled personnel to sensitize on its importance. This study therefore investigated the implementation of SFP in Early Childhood Development (ECD) centres in Bomet County with a view to establish its relationship on children’s enrolment and attendance in Chepalungu Sub-county. This is because about 65% of children in Kenya do not attend pre-school Education and 57.7% do not attend school in Chepalungu, Bomet County. Presumably the study sought to investigate the relationship between SFP and school attendance and enrolment. The study was guided by Abraham Maslow’s theory of hierarchy of needs and employed descriptive survey design whereby the independent variable was feeding programme while the dependent variables were pre-school attendance and enrolment. Observation schedules, questionnaires for ECD teachers as well as head teachers, interview schedule for Director of Education and document analysis were used to collect data. Statistical Packages for Social Sciences (SPSS) was used to organize and prepare data for analysis. The findings revealed that there is relationship between SFP and children’s school attendance and enrolment. This implies that there is a need to provide SFP in Chepalungu Sub-County. Stakeholders that include the County government should work hand in hand to provide SFP in pre-schools.

CONSTRAINTS FACING THE IMPLEMENTATION OF REVERSE INTEGRATION IN SPECIAL PRIMARY AND SECONDARY SCHOOLS IN MOMBASA COUNTY, KENYA

NEVILLE M. C. YERI – M.Ed

Department: Special Needs Education

Supervisor: Dr. Nelly Otube.

Prof. John Aluko Orodho.

The purpose of this study was to investigate constraints to the implementation of reverse integration in special primary and secondary schools in Mombasa County, Kenya. It was guided by a set of objectives which were followed up with a corresponding set of research questions. A theoretical framework based on Albert Bandura’s Social Learning Theory was adopted. The study adopted a descriptive survey design that used an exploratory approach to investigate the problem at hand. The target population comprised of 1019 students, 88 teachers as well as 46 non teaching staff, totaling to 1163 respondents. Purposive sampling technique was used to select three schools (42%) out of the seven special schools in the study locale. Stratified random
sampling technique was used to select 36 students (5%) from the various strata of student’s population. Ultimately, the sample was 71 respondents, representing approximately 10% of the population in the sampled schools. Data was collected using two types of questionnaires one for teaching/non-teaching staff and the other for students. Tools reliability was ascertained through the test re-test method, while content validity was confirmed by the researcher’s supervisors. Analysis of quantitative data was done using the Statistical Package for Social Sciences (SPSS) version 17.0, while qualitative data was analyzed descriptively. Descriptive statistics (measure of central tendency) was used to analyze the data from the respondents. Quantitative variables were cross tabulated with the dependent variable of reverse integration including administrative factors; school staffs qualifications, experience and training, status of educational materials in terms of relevance, adequacy and effective use and non academic issues such as policy shifts. The study found out that the reverse integration was a laudable policy that would enhance mutual co-existence between children with special needs and those without special needs. The study also found out that administrative factors greatly influenced the implementation of the reverse integration education policy. The level of experience and professional qualifications of the teaching staff also affected implementation of the policy. Results of the study on the influence of educational materials and facilities showed that most schools lack the resources especially libraries and laboratories. It found out that most of the schools were in dire need of support from all the stakeholders in order to provide emotional, financial and material support to the students. The study recommends that the reverse integration policy’s implementation should be enhanced in order to provide an equal opportunity to all the children. In addition, schools should redouble, their efforts in the provision of a conducive learning experiences for children joining the programme. The study also recommends that a nationwide study be launched in order to find out the current level of pressure and available resources in the schools.
AN EVALUATION OF THE INFLUENCE OF EARLY INTERVENTION SERVICES ON DEVELOPMENT OF CHILDREN WITH PHYSICAL DISABILITIES IN RUIRU SUB-COUNTY, KIAMBU COUNTY, KENYA

NDERITU HELLEN WANJIRU – M.Ed

Department: Special Needs Education.

Supervisors: Dr. Franciscah I. Wamocho.

Dr. Syprine Otieno.

The purpose of this study was to evaluate the influence of early intervention services on development of children with physical disabilities in Ruiru Sub-County, Kiambu County, Kenya. The study adopted a descriptive survey design to select the respondents. The study targeted 8 heads of schools, 8 related service providers, 8 teachers, 160 parents and 160 children with physical disabilities. Purposive sampling was used to select 4 schools selected due to availability of communities which represent the range of variations on categories of physical disabilities, 4 heads of schools, 6 related service providers, 4 teachers, 1 EARC officers while stratified random sampling was used to select 32 parents of children with physical disabilities totaling to 47 respondents. The researcher used questionnaires and interview guide to collect data. The data collected were coded and analyzed manually. From the study findings, it was established that majority of schools involved parents in guidance and counseling, making the children get exposed to early intervention services. A correlation together with regression analyses were done and established positive relationship between most early intervention services. The value of R square of .928 showed that the model could accurately predict the outcome of the dependent variable to an accuracy level of 92.8% as well as that the independent variables account for 92.8% changes in the dependent variable. From the ANOVA, the model is significant (P<.05, df=5) and the value of R-Square=0.187 implies that a unit change in availability of intervention services, programs offered in isolation or combination, rate of parent commitment, relationship with personnel and teachers, related professionals’ involvement in the programs and services led to an increase in the rate specific milestones for children after receiving early intervention services by 18.7%. The study concluded that early intervention services affected the development of children with disabilities, parental involvement impacted positively on early intervention
The study recommended that the Government increase publication and dissemination of information regarding the benefits of early intervention services for children with disabilities.

DETERMINANTS OF QUALITY OUTDOOR PLAY ENVIRONMENT IN EARLY CHILDHOOD DEVELOPMENT CENTRES IN NG’ENDA ZONE, KIAMBU COUNTY, KENYA

NDOI JANE WANJIKU – M.Ed

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Dr. John Teria Ng’asike

Quality childcare include providing children the opportunity for outdoor play. In Kenya even though play is recognized as critical in children development, research in children’s play environment appears inadequate. The purpose of this study was thus to establish the quality of outdoor play environment in early childhood development centres in Ng’enda Zone of Gatundu South Sub-County. The study was also to determine the key factors influencing outdoor play environment in ECD centres. The study findings may be of significance to early childhood teachers, ECD managers and policy makers of early childhood programmes in that the results may help them to develop skills on school-based safety programmes that assist in promoting, protecting and improving the safety status of pre-school children while in the playgrounds. The study was based on Piaget Developmental Theory of Play. The study employed the descriptive survey research design targeting all the 31 ECD managers/head teachers and 112 teachers in the 31 ECD centres in Ng’enda Zone. Stratified random sampling was used to sample 10 ECD centres according to type of ECD centre. Ten head teachers and zonal education officer were selected purposively while simple random sampling was used to select the teachers. An interview schedule designed for managers/head teachers, a questionnaire for teachers and an observation checklist were used for data collection. Before actual analysis was done, a pilot study was conducted in 2 ECD centers which were not included in the actual analysis. The importance of carrying out a pilot study was to determine the reliability and validity of the research instruments. Data collected was entered in the computer for analysis using the Statistical Package for Social Sciences (SPSS). Qualitative data was first coded by organizing it into similar themes and then tallying all similar responses of each item. Descriptive statistics such as percentages,
means and frequencies were used to report the quantitative data. Data was presented in form of tables and figures. The study established that the most available play materials in public ECD centres were small balls and tyres while in private ECD centres, swings, fixed tyres, small balls, and ropes were available. On the other hand, swings, climbing ladders, slides, fixed tyres and balancing frames were not available in public ECD centres as opposed to the private centres where balancing frames, hoops and see saw were unavailable. The study also found out that the most adequate playing materials in both public and private ECD centres were small balls, ropes and tyres. However, the most inadequate outdoor facility from all the sampled public pre-schools were; bar beams, followed by climbing ladders, slides and then fixed tyres. Most of the private ECD centres had inadequate playground compared with the number of children registered and therefore they did not facilitate effective children play activities. The study recommends that; government, parents and other education stakeholders should offer their support through funding of ECD centres and also provision of playing materials; Pre-school teachers in both public and private ECD centres should support children during outdoor activities especially in planning play activities. They should also give children time to explore and discover on their own through play activities. Ministry of Education should ensure that all the private ECD centres have adequate play space to ensure that children are engaged in outdoor activities; among other recommendations.

AN ANALYSIS OF THE PEDAGOGICAL APPROACHES TO CHARACTER FORMATION IN KENYAN SCHOOLS: IN SEARCH OF AN ALTERNATIVE

OSABWA WYCLIFFE – M.Ed

Department: Educational Foundations

Supervisors: Dr. Jackton O. Ogeno

Dr. Daniel B. Nyanje

Kenya has been witnessing a persistent increase in cases of individuals displaying negative social dispositions, indicating a nation on the moral decline. Evidently, majority of the citizens continue to act contrary to such basic values like respect, honesty, responsibility and diligence, a situation that threatens harmonious coexistence and consequently national progress. The above state of affairs has prevailed despite efforts by the government to inculcate good character among children through schools. This study therefore, ventured to investigate the approaches that
Kenyan primary and secondary schools have been employing in their effort to form positive character among pupils. This prompted an evaluation that aimed at understanding and enriching the approaches, or proposing a more viable alternative that would facilitate realization of good character. Thus, the objectives of the study were to explore the concept and significance of character formation; establish how Kenya has carried out the practice of character formation over the years; evaluate the pedagogy thus employed; and propose a more viable alternative. To understand how character is formed, the study was guided by Aristotle’s theory of Moral Virtue, which would be operationalized by Thomas Lickona’s model of Comprehensive Character Education. Both Aristotle and Lickona hold that good character is developed over time through a sustained process of teaching, role modeling, learning and practice. For Aristotle, intellectual understanding of virtue allows one to perceive what is right, while moral virtue aids one in carrying out actions correctly and justly. To this effect, Lickona prescribes a model that can guide the creation of good character through education programmes in which pupils are taught in an intelligible way. The study employed the Analytic and Socratic methods. First, the conceptual analysis assisted the researcher to evaluate documents such as government policies, syllabi, research reports and Character Education programmes, for insights. Thereafter, the Socratic Method came into enable the researcher to reflect on the rationale behind the approach to character formation before proceeding to propose away forward. After a critical analysis, the study observed that the approaches in place are grossly deficient in terms of design and implementation. It thus concluded that this state of affairs could be contributing to the continued failure to nurture individuals of good character. Pursuant to this, the study recommended a comprehensive review of the existent approaches so that they are formulated in line with integral character education trends.

INTEGRATION OF INFORMATION COMMUNICATION TECHNOLOGY IN TEACHING OF ENGLISH IN SECONDARY SCHOOLS IN NYAKACH SUB-COUNTY, KISUMU COUNTY, KENYA

OWINO JANE KAREJI – M.Ed

Department: Educational Communication & Technology

Supervisors: PROF. JOHN N. KIMEMIA.

DR. ADELHEID M. BWIRE.
The problem of this study was that, in spite of the enormous benefits of ICT in everyday life in and out of school, only few schools have embraced the use of ICT in teaching and learning. This study sought to investigate the extent to which teachers were using ICT in the teaching and learning of English in secondary schools in Nyakach Sub-County, Kisumu County. The study also sought to find out which ICT resources were available for the teaching and learning of English and to find out which areas of English teaching and learning these resources could be used. The study was both a quantitative and qualitative research in nature and adopted a descriptive survey design. Descriptive methods were employed in analyzing data using frequencies, percentages and means. Descriptive methods were preferred because they would enable the researcher to meaningfully describe the distribution of scores and measurements using statistics. The study used a combination of stratified, purposive and random sampling procedures. The sample of the study was drawn from the twenty two secondary schools in Nyakach Sub-County which had been given ICT facilities and the respondents were 7 principals of secondary schools, 16 teachers of English and 540 Form Three students. Questionnaires and observation schedules were used to get information from the respondents. Before the instruments were used for collecting data, a pilot study was conducted in two public secondary schools in Nyando Sub-County which had the same characteristics as the sampled schools. The theoretical framework used to guide the study was the Constructivism Theory associated with Bruner, J. Data collected was analyzed using the Statistical Package for Social Sciences (SPSS-Version 19.0). The findings showed that the use of ICT in the teaching and learning of English was still in the formative stage and faced various challenges. The available ICT resources were occasionally used in varied proportions to teach English. This study recommends that ICT be fully integrated in the education system; all teachers of English be trained in the use of ICT, school managers and other stakeholders be sensitized on the need to provide ICT facilities in the schools and lastly, intensive resource mobilization be put in place to enable schools acquire ICT resources.
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 stakeholders. 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.
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 Mheso-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.
LEARNERS’ PERCEPTIONS AND PRACTICES ON PHYSICAL ACTIVITY: A CASE OF SELECTED REGULAR AND INTEGRATED SCHOOLS IN NAIROBI COUNTY, KENYA

NYAGA MICHAEL SIMON – M.Ed

Department: Special Needs Education
Supervisors: Prof. Geoffrey K. Karugu.
Prof: James E. Otiende.

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’ were 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

JENIFFER NDUNGULU MUTIE – M.Ed

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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, schoolfeeding 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 ITS EFFECTS ON THE ACADEMIC PERFORMANCE OF THEIR CHILDREN IN SELECTED PRIMARY SCHOOLS IN KIAMBU COUNTY, KENYA

EUNICE WANJIRU KAMAU – M.Ed

Department: Special Needs Education.

Supervisors: Dr. Madrine King’endo

Prof. G. 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.
SCHOOL OF ENVIRONMENTAL STUDIES

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

MAINA PAUL MWANGI-M.ENV

Department: Environmental Studies and Community Development

Supervisors: Dr. Samuel Ochola

Prof Simon Onywere

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.

CROP GERMINATIVE EMERGENCE OF MAIZE (Zea mays) AND FINGER MILLET (Eleusine coracana) AS AFFECTED BY PLASTIC WASTE MATERIAL

NJIRU MAGDALENE KAGENDO-M.Env

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Dr. James K.A. Koske

Plastic waste material continues to present environmental challenges throughout the world. Of greatest concern is their disposal in agricultural soils where they interfere with soil fertility due to its inability to decompose fast. Specifically, the research examined under experimental conditions the crop germinative emergence of (Zea mays L.) and finger millet (Eleusine coracana (L.) Gaertn) as affected by plastic waste material commonly disposed in urban and rural environments of Kenya. The plastic types were identified by their thickness, that is, thin (6 microns) and thick (30 microns). The experiment was laid out in a 2 by 2 Randomized Block Design (Latin Square) with three replicates in plots each measuring 1m x 1m. The data collected involved determination of emergence percent cover. The date of planting was noted and records were taken from the day first shoot emergence was observed in controls for 10 days. Percent emergence measurements was done for at least 10 days and this involved taking of vertical photographs of each plot from the day first shoot emergence was observed in controls. Assumptions of normality were found to be satisfactory and the set hypotheses were supported by the results. There were significant differences (P<0.05) between E. coracana in soils mixed with thin plastic material and the ones planted in soils without. In the overall, the Emergence Percentage Cover (EPC) mean for the E. coracana planted in soils mixed with thin plastic material was 37.83%, while that of controls were 75.58%. There were significant differences (P<0.05) between Z. mays planted in soils mixed with thin plastic material and the ones planted in soils without plastics. The EPC mean for the Z. mays planted in soils mixed with thin plastic material was 49.95%, while that of controls was of 86.18%. There were significant differences (P<0.05) between E. coracana planted in soils mixed with thick plastic material and the ones planted in controls. The EPC mean for the E. coracana planted in soils mixed with thick plastic material was 25.78%, while controls had 75.58%. There were significant differences (P<0.05) between Z. mays in soils mixed with thick plastic material and the ones planted in controls. The EPC mean for the Z. mays planted in soils mixed with thick plastic material was 41.52%, while that of control groups was 86.18%. In conclusion, there were a significant differences (P<0.05)
in effects of both thin and thick plastic material on germinative emergence of the two food crops, that is; *E. coracana* and *Z. mays* and hence the study recommends that, plastic waste material of any thickness should be avoided on farmlands where *Z. mays* and *E. coracana* are grown.

**THE UTILISATION AND CONSERVATION OF INDIGENOUS MEDICINAL PLANTS IN SELECTED AREAS IN BARINGO COUNTY, KENYA**

**CAROL JERUTO ROTICH-M.Env**

**Department: Environmental Sciences**

**Supervisors: Dr. Najma Dharani**

**Dr. Esther Kitur**

There is a growing demand for indigenous medicinal plants and an increasing interest in their use among Kenyans who depend on them for one use or another. The study was conducted with the main objective to determine the utilization and conservation of indigenous medicinal plants in Koipirir, Ilchurai and Ikumae in Baringo County. The specific objectives were to assess the composition and abundance of the common Indigenous Medicinal Plants in the study areas, to find out the diversity and evenness of Indigenous Medicinal Plants (IMPs) in the study areas, to determine the modes of utilization and harvesting of Indigenous Medicinal Plants among the rural communities in the study area and to find out the conservation measures in place to conserve Indigenous Medicinal Plants among the rural communities in Baringo County. Primary data were collected through the use of semi-structured and structured questionnaires which were administered to 96 households, 12 herbalists and 4 key informants. This was supplemented by regular field visits, site visits and personal observations. Transects and quadrats were also used to
find out the composition, evenness and diversity of the locally utilized medicinal plants in the study area. Data obtained from the questionnaires were subjected and analyzed using SPSS version 20. Data on species abundance were analyzed using Biodiversity Calculator Index while Eveness and Diversity were analyzed using Shannon Weiner Index. The results showed that 84% of the respondents preferred Indigenous Medicinal Plants as means of treatment while only 16% preferred modern medicine. *Balanites aegyptiaca* (26.26%), *Acacia nilotica* (17.68%) and *Balanites aegyptiaca* (15.80%) were abundant in Koipirir, Ilchurai and Ikumae respectively. Ikumae had high species diversity (H”2.698) and evenness (0.849), as compared to Koipirir (H”2.447) and (E 0.769) and Ilchurai (H”2.511) and (E 0.7901). Despite the different modes of utilization of the locally available IMPs in the study areas, there was no correlation that was significant at (0.05) levels except between Utilization of IMPs as medicine and construction purposes which was (0.207). Out of the 24 species identified, locally endangered species were recorded when the respondents indicated that they do not harvest nor utilize the species at all, though it was utilized before. These included the *Azadirachta indica* and *Vepris simplicifolia* which was totally absent in Ikumae, *Ximenia americana* and *Solanum aculeastrum* were totally absent in Ilchurai while *Albizia anthelmintica*, *Cussonia holstii*, *Leonotis nepetifolia* and *Senna didymobotrya* were rarely found according to the study. Animal grazing, firewood collection, herbs collection, placing beehives and gathering fruits were being carried out in the conservation areas which are the natural habitats of the IMPs thus leading to IMPs destruction. Therefore the study concludes that the locals should be educated to create awareness on conservation in the study area so as to ensure sustainable use and conservation of the Indigenous Medicinal Plants.
INFLUENCE OF FISH TRADE ACTIVITIES ON THE ENVIRONMENT IN GIKOMBA FISH MARKET, NAIROBI COUNTY, KENYA

MWANGI, ALBERT MAINA-M. Env

Department: Environmental Sciences
Supervisors: Dr. Richard Kerich
Dr. Theresa C. Aloo

Post-harvest fisheries activities have been cited as contributors to environmental degradation. The current sanitary situation in urban fish markets is worrying and present threats to the public health and the surrounding environment. The research aimed to investigate and understand how the fish trader’s activities influence the environmental situation in fish markets. A descriptive survey design was used for the research. The target for the study was the fish traders of Gikombamba fish market, Nairobi. Random sampling of fish traders was done from a register, using Fischer’s formula, to calculate the number of respondents. Data was collected through a structured questionnaire and was processed using EXCEL and SPSS software packages. Descriptive statistics (frequencies, percentages,) and inferential statistics (Chi square and Logistic Regression) were used to explain the variables. 54% of the respondents did not get piped water. 63.5% of the respondents did not have waste bins and only 31.5% participated in clean-ups. Majority (60.5%) of the respondents noted that fish wastes had a negative effect on the environment. Chi square tests results for fish operator practices in most attributes was statistically associated with environmental situation (P< 0.05). Logistic regression tests results proved that practices such as use of water, disposal of wastes, use of protective clothing and participation in cleanups had a statistically significant influence on the environmental situation (P< 0.05). Perceptions attributes on amount of waste generated, possession of health certificates, drainage infrastructure had a significant influence on the environmental situation (P< 0.05). The researcher noted that 76%, respondents exhibited high level of awareness on the governmental institutional requirements on hygiene and participation in environmental management. Awareness on government institutions services and options available on fish wastes recycling were attributes that significantly affected the environmental situation (P< 0.05). The overall findings led to a support of the key research hypotheses that fish handling practices is significantly related to the environmental situation (P<0.05), perception on environmental management is significantly related to the environmental situation (P<0.05), and awareness on institutional guidelines is significantly related to the environmental situation(P<0.05). The study concluded that fish trade activities affect the environmental situation. Improving on the identified key attributes would result in an improved environmental situation. The research recommended that the Department of Fisheries needs to review the modalities for fish handling throughout the
marketing chain. Emphasis should be put on disposal of fish wastes in the major fish markets, fish wastes recycling options, training of fish operators and capacity development of staff.

CHALLENGES AND OPPORTUNITIES OF PARTICIPATORY MANAGEMENT OF UPLAND WETLAND IN KIAMBU COUNTY, KENYA

MWAURA SAMUEL KINYARIRO-M.Env

Department: Environmental Sciences

Supervisors: Prof. S.G. Njuguna

Dr. G. Macharia

Wetlands are continuously degraded via agricultural activities, pollution and settlement. In Lari sub-county for example, increase in population pressure, decline in soil fertility, unreliable rainfall plus quest for food security is forcing the farmers to encroach on the seemed idle Upland wetland. Opportunity for conservation of this wetland lies on the participatory approaches that can be embraced at local level helping in conservation of this vital natural resource. Ruiru river main water comes from Upland wetland which is harvested by Nairobi Water and Sewerage Company in Githunguri sub-county at Ruiru dam. The wetland plus Kikuyu east escarpment forms part of catchment area that amounts to 6680 ha. The research is of vital importance as the water company lacks in depth information about its catchment areas, leading to their encroachment and eventually water rationing in Nairobi city. The objectives of this study were to document causes of Upland wetland degradation, assess extent of community participation, and investigate level of awareness on wetland importance and possible contribution of farmer’s involvement on catchment management. Sampling methods used to select the study units included stratified and random sampling where farmers and Ruiru dam workers were issued with questionnaire. Purposive sampling was used to select WARMA manager, WRUA officials and six elderly who were interviewed. A total of 40 farmers from Lari 107 settlement scheme where wetland is located and 4 Ruiru dam workers were issued with questionnaire. Data analysis was done using Chi-square, T-test and SPSS computer packages. The percentages for qualitative data
were presented using tables, bar charts and pie charts. Mapping of the wetland was done using GIS and Google Earth. The study found that Upland wetland total cover area is 129.6 Ha after getting reduced by 105.4. Ha for the last thirty years due to encroachment. The study revealed that 65% of the respondents had stayed in the area for more than 20yrs. Farmers engage in wetland drainage mostly for provision of food (50%), generate income (25%) while 10% did it to control water borne diseases. Level of participation was negligible with only 2.5% of respondents having ever participated in wetlands conservation. Community based conservation groups such as WRUA were lacking in this area. Respondents amounting to 87% were not aware of conservation bodies such as WRMA or their activities. Environmental impacts were: biodiversity loss, destruction of ornithology habitats and loss of hydro botanical species. Social impacts were: eruption of water borne diseases such as typhoid, water pollution and weak community conservation infrastructure. 87.5% indicated that lack of institutional support from Nairobi Water and Sewerage Company and Water Resource Management Authority to fund, educate and assist local people in catchment conservation is the major cause of poor participatory Thus using one sample t-test on the level of participation t-56.00, df=39, p=0.001, there was a significantly low level of participation in management at Ruiru river source wetland. However, there is an opportunity for community involvement in that majority of residents were ready to conserve(X2=0.127, p=0.001). Formation of community based conservation groups such as Water Resource Users Association, Riparian Land Owners Association and Catchment Area Advisory Committee were proposed as major solutions to the problems. Devolution of water resources was also proposed as a way of ensuring local people gets some benefits from water sale to city residents. Such efforts will ensure adequate water supply to Nairobi city and surrounding satellite towns.
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 *Croton macrostachyus* Hochst. ex Delile, 1847, *Periploca linearifolia* Linnaeus, 1753 and *Vernonia auriculifera* Linnaeus, 1847. *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, Kabianga 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 $p\leq0.05$. 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.

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

MBWIRIA LUCY MUTHONI – M. Env

Department: Environmental Studies and Community Development.

Supervisors: Dr. Jane W. Mutinda,

Dr. Stephen N. Nyaga

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.

DEMAND AND SUPPLY DYNAMICS OF WOOD ENERGY IN SCHOOLS IN TRANS-NZOIA COUNTY, KENYA

NYAMBANE ANNE WANJIRU-M.Sc

**Department:** Environmental Science

**Supervisors:** Dr. Gathu Kirubi

Dr. Evans Kituyi

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±91.75kg 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 0.34kg per student daily and 91.8kg 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.
SCHOOL OF HEALTH SCIENCES

DEVELOPMENT OF CHROMATOGRAPHIC FINGERPRINTING AND OTHER QUALITY EVALUATION METHODS FOR WARBURGIA UGANDENSIS SPRAGUE HERBAL MATERIALS

ONYAMBU MESHACK ONDORA-Ph.D

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Supervisors: Prof. Nicholas K. Gikonyo
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Prof. Grace N. Thoithi

Warbugia ugandensis Sprague is among the ten most utilized herbal medicines in Kenya with both scientific and ethnobotanical evidence of antimalarial, antileishmanial and antibacterial activity. The contribution of this plant to primary healthcare of many Kenyans is evident from the sale of its products in commercial outlets. The plant is currently endangered and therefore, there is fear of adulteration and/or substitution because there are no standardized procedures to assure quality and authenticity of its products in the market. The objective of this study was to investigate the macroscopic, microscopic, microbiological, physicochemical, phytochemical and chromatographic parameters for use to control the quality of Warbugia ugandensis leaf and stem-bark products. Plant samples from Kenyatta University Medicinal Plant Research Garden were used as reference during method development while twelve plant samples from six geographical zones and ten commercial ones were analyzed for similarity and quality respectively using the developed methods. All the samples were obtained by random purposive sampling technique. The samples used for method development and similarity evaluation were
harvested, processed and stored using WHO recommended methods on good agricultural, collection and processing practices for medicinal plants. Macroscopic and microscopic studies of the whole and powdered leaf and stem-bark were done based on a modified method from the American herbal pharmacopoeia while physico-chemical, microbiological and phytochemical studies were done based on modified WHO methods. Chromatographic methods including thin layer chromatography, high performance liquid chromatography and gas chromatography-mass spectrometry were developed and used for quality analysis. The study revealed over 5 major organoleptic characteristics of *W. ugandensis* leaf and stem-bark including strong aromatic odor and bitter taste. Major microscopic characteristics of the leaf included anomocytic stomata and epidermal cells with anticlinal primary walls. Microscopy of stem-bark revealed brownish lignified parenchyma and schlerenchyma cells, xylary fibers in addition to clusters of simple starch granules. Microbial purity showed less than 30 colony forming units (cfu) for both the leaf and stem-bark in addition to absence of *Escherichia coli, Salmonella typhi* and *Pseudomonas aeruginosa*. Physicochemical studies showed ethyl acetate extractable matter of 8.55% and 9.18%, for the stem-bark and leaf, respectively. Phytochemical evaluation of both stem-bark and leaf powders showed relatively high concentrations of cardiac glycosides, tannins and saponins. Normal phase silica TLC method visualized sixteen spots for the stem-bark and eighteen for the leaf. Reversed-phase HPLC method showed four to six well separated peaks while the GC-MS method separated more than 100 compounds. However, 22 and 38 compounds from stem-bark and leaf respectively were selected as fingerprints for quality evaluation. The phytochemical, physicochemical, TLC and GC fingerprinting methods showed that there were some similarities and differences in the chemical patterns of *Warbugia ugandensis* stem-bark and leaf from each of the six geographical zones in Kenya. Analysis of commercial products by TLC confirmed that
they contain *Warbugia ugandensis* as per the claim. Four samples passed with 80-100% consistency with the reference GC-MS fingerprint. The study therefore concluded that the quality of *Warbugia ugandensis* leaf and stem-bark can be evaluated by macroscopic, microscopic, microbiological, physicochemical, phytochemical and chromatographic techniques. It is therefore recommended that these techniques should be used to verify purity and authenticity of herbal materials based on *W. ugandensis*.

**EVALUATION OF SAFETY AND THERAPEUTIC POTENTIAL OF ENVIRONMENTAL WASTE WATER LYtic BACTERIOPHAGE AGAINST MULTIDRUG RESISTANT *Staphylococcus aureus* (MDRSA) IN BALB/c MICE**

**ODUOR JOSEPH MICHAEL OCHIENG-M.Sc**

**Department**: Medical Laboratory Science

**Supervisors**: Dr. Washingtonne Ouma Arodi

**Dr. Atunga Nyachico**

Methicillin resistant *Staphylococcus aureus* (MRSA) pose a great threat to the global public health. Control of these bacteria has become difficult due to acquisition of resistance against even some of the best antibiotics. Thus, phage therapy could be the better alternative as they are easy to isolate and produce in mass within a short time. However, phage therapy has been a subject of debate over the years but recently there has been a renewed interest due to their proved therapeutic potential and have, therefore, found commercial application in some countries. Thus, this study was specifically designed to evaluate the efficacy of phages against MRSA both *in vitro* and *in vivo*. A litre of environmental waste water and sewage samples were collected around the county of Nairobi. The MRSA isolates were obtained from environmental waste water and sewage samples from Nairobi and its environs and evaluated for drug resistance using antiibiogram test. In addition, lytic phages were isolated from these samples too. Thereafter, the
in vitro efficacy of the phages against MRSA was done by spot assay and tube culture tests. Only the most virulent phage isolate was used for in vivo efficacy study which involved six groups of mice of n=5 per group (BALB/c mice; both sex). The first three groups acted as controls (group 1=only physiological saline, group 2=MRSA bacteria only and group 3=phage only) while the remaining groups were used for efficacy studies using a dosage of 108 CFU/ml for MRSA bacteria, 108 PFU/ml for phage and clindamycin at 8mg/kg. The efficacy study groups (groups 4-6) were first infected by MRSA and observed for 3 days before treatment with either antibiotic (group 4), or phage (group 5) or phage + antibiotic (cocktail therapy group 6). The mice were then observed for an additional 7 days. During the entire 10 days of observation blood samples were collected daily for bacteremia level determination before being euthanized. Different organs including the liver, brain, kidney and lungs were harvested for histopathological studies. All studies were done in accordance with the IPR Institutional Ethical Committee approved protocols. Antibiogram test indicated that MRSA isolated was a multidrug resistant strain (Figure 1). While the in vitro test showed the virulence of the phage isolates after 24 hrs culture at 370C. Toxicity test showed that phages were safe. There was no significant difference in survival rates between phage infected group and non-infected control group ($p>0.05$). Bacteremia was significantly lower in phage treated group as compared to other treatment groups and bacteria non-treated group ($p<0.001$) (Figure 2). In addition, pathological results show that phage prevented organ damage by the bacteria (Figure 3). Thus, a single dose of phage was more effective than other therapeutic agents used in the study.
PREVALENCE OF HIV/HCV CO-INFECTION AMONGST HIV SERODISCORDANT COUPLES IN THIKA, KENYA

SUSAN WAIRIMU WAWERU-M.Sc

Department: Medical Laboratory Sciences

Supervisors: Dr. Margaret Muturi
Dr. Kenneth Ngure

Immune defects caused by Human immunodeficiency virus (HIV) and Hepatitis C virus (HCV) co-infection could alter the course of secondary infection and dysregulated innate immune responses could contribute to a more rapid disease progression. The prevalence of HCV and HIV co-infection in Kenya varies with different risk groups. Currently, there is parity of data on the prevalence of HIV/HCV co-infection in Kenya. It is also not known how the CD4+ and CD8+ counts correlate with HIV viral load in HIV/HCV co-infected individuals. This study focused on determining the prevalence of HCV and how the CD4+ and CD8+ counts correlate with HIV viral load in HIV/HCV co-infected individuals amongst HIV serodiscordant couples in Thika. Plasma samples from HIV serodiscordant couples that had been collected over a period of 2 years (2006-2008) and stored at -20° C at the Clinical Trials Research Laboratory (CTRL) were used. All the samples from both HIV negative and positive participants were tested for HCV antibody using Murex anti-HCV (version 4.0) microelisa kit. HIV RNA viral load and CD4+/CD8+ counts were obtained from already archived data for the participants that were co-infected with HIV and HCV. A total of 385 samples from HIV serodiscordant couples were used in this study; 196 HIV positive samples and 189 HIV negative samples. Data was analyzed using mean (standard deviations), medians (inter-quartile range), Pearson correlation, Pearson chi square test, McNemar chi square test, ranksum test and t-test as appropriate using Stata version 12.1. Results obtained from this study showed that the mean age of the participants was 34.2 years. 192 of the participants were male (49.9%) and 193 (50.1%) were female. Overall, 13 (3.4%) of the participants were positive for HCV, most of whom 11(5.6%) were HIV positive, p= 0.013. There was no statistically significant difference between HCV infection on the basis of
gender, 7 (3.6%) vs. 6 (3.1%), p= 0.785. A negative correlation was observed between HIV Viral load and CD4+ T cells amongst HIV/HCV co-infected participants without statistical significance; r= 0.600, p= 0.070. A positive correlation was observed between HIV Viral load and CD8+ T cells amongst HIV/HCV co-infected participants without statistical significance r= 0.4525, p= 0.162. There was a statistically significant higher median (IQR) HIV Viral load (copies/mL) at baseline among those positive for HIV/HCV co-infection than those who were HIV mono-infected, 89775 vs. 10695, P= 0.0436. Those positive for HIV/HCV co-infection had a lower median CD4+ (IQR) than those who were HIV mono-infected, however without statistical significance, 383 vs. 499, p=0.0772. Those positive for HIV/HCV co-infection had a higher median CD8+ (IQR) than those who are negative for HIV/HCV co-infection, however without statistical significance, p=0.2250. None of the serodiscordant couples were both found to be positive for HCV indicating that HCV may not have been transmitted sexually. A longitudinal study is recommended using a higher number of participants and also inclusion of more laboratory tests and parameters to give a better understanding of the effect of HIV/HCV co-infection on disease progression amongst participants.
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

Department: Community Health

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 of Sabatia District based on this policy and its guidelines. The target population consisted of all the 102 primary schools in Sabatia district. Thirty one (31) schools were clusterly and randomly selected for study. The objectives of the study were to describe the current health status of the schools by determining the risk factors for disease transmission and identifying the measures that are in place for prevention and control of the 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. Structured, non-structured questionnaires, focus group discussions (FGDs), key informant interviews (KII) and observational checklist were employed to collect data. 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.

PREVALENCE AND FACTORS ASSOCIATED WITH BRUCELLOSIS AMONG COMMUNITY MEMBERS IN MANDERA COUNTY, KENYA

ABDIRAHMAN S. ABDALLA-M.P.H

Department: Community Health

Supervisors: Dr. Justus O. S. Osero

Dr. Peterson N. Warutere

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.

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

**FRANCIS KYALO MUEMA-M.P.H**

**Department:** Community Health

**Supervisors:** Dr. George O. Otieno

Dr. Justus O. S. Osano

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.

ASSESSMENT OF THE HEALTHCARE PROVIDERS KNOWLEDGE AND CAPACITY TO DETECT RIFT VALLEY FEVER INFECTIONS IN MARAGUA SUB-COUNTY OF MURANG’A COUNTY OF KENYA

GACHERU STEPHEN GITAU-M.P.H

Department: Community Health
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Dr. Yatinde S. Binepa

Rift valley fever (RVF) is a zoonotic mosquito-borne viral disease found in Africa and other continents and is documented in Kenya since 1910. Mosquito and other insect bites, contact with body fluids during slaughter, milking, treatment and examination and consumption of under-cooked contaminated animal products transmit the disease. In epizootic areas, RVF causes abortion in majority of pregnant ewes and cows while high mortality occurs among newborn lambs making diagnosis easy. In humans the disease causes hemorrhagic fever, encephalitis, retinal vasculitis and death. Laboratory confirmation is necessary especially when RVF extends to new regions. The lack of capacity and ability to detect RVF infections early has resulted in massive economic losses in herds of sheep and cattle, and human fatalities. Outbreaks are associated with high population of vector insects as occurs following unusually high level rainfall with prolonged flooding. With the increasing trends of flooding in Kenya, it is apparent that there is need for more attention on the disease. Outbreaks in Kenya are in 5-15 years’ cycle, the most recent being December 2006 to June 2007. Since the first outbreak, Murang’a County has always been one of the high risk areas. The capacity of healthcare providers and healthcare facilities in Murang’a County to handle and diagnose RVF is not known. This study assessed the capacity of healthcare providers’ and healthcare facilities to diagnose Rift Valley Virus infections. Sixty-six (66) healthcare facilities, Government, Private and Faith-based were censured, data obtained and relevant data on Rift Valley Virus infections extracted for analysis. Data was collected by administering structured questionnaires to eighty-four purposely and
conveniently selected healthcare providers in the healthcare facilities while the capacity of the healthcare facilities was determined by a checklist as per World Health Organization (WHO) standards for RVF diagnosis. The data was processed using Statistical Package for Social Sciences. This study found that the healthcare providers lacked the capacity to detect RVF while most facilities lacked equipment to detect and handle RVF. There was no significant difference in education and training levels of the health care providers in the health care facilities (P=0.5132) and (P = 0.8124), respectfully. The tools, equipment and facilities available in the healthcare institutions were found to be below the WHO expectations. The study recommends carrying out similar studies in other high-risk counties for better understanding and preparedness in case of an outbreak. The study also informs the Kenya Government on the priority areas of training, re-training and requirements of healthcare providers especially in high-risk locations.

UTILIZATION OF HERBAL MEDICINE AMONG CHILDREN UNDER 5 YEARS OF AGE IN THARAKA NITHI COUNTY, KENYA

DAVID MWIKYA NZUKI-M.P.H

Department: Community Health

Supervisors: Prof. Nicholas K. Gikonyo

Dr. Peterson N. Warutere

The use of herbal medicine is on the rise globally, especially in developed countries. Indeed, over 80% of the populations in developing countries depend on herbal medicine. In Kenya herbal medicine is widely used, with 70% of the population having been reported to be dependent on it for primary health care. The World Health Organization (WHO) warns that growing use of traditional medicine, both in developed and developing nations, has been mirrored by an increasing number of reports of adverse effects and deaths. The indications are that there is increased child mortality due to herbal medicine use and concomitant use of herbal medicine and conventional medicine among under-five years of age. This study examined the utilization of herbal medicine among under-five years of age in Maara division, Tharaka Nithi County. The study was descriptive cross sectional in design and used structured interviews, questionnaires, and Focus Group Discussions (FGDs) Guide as instruments for collecting both quantitative and qualitative data. The study was located in Mwimbi Division in Tharaka Nithi County, an area covering 1570 square km with a population of 64,380 people. The instruments were pretested at Muthambi division in Tharaka Nithi County. A sample of 350 parents and guardians of under-five years of age children from five locations across the division were used for the study. In addition, 10 conventional health care practitioners were sampled through purposive sample. Data was analyzed using Statistical Package for Social Sciences (SPSS) version 17.0 software. Percentages, frequencies, cross tabulations, and pie charts were used to present the data. Chi-square test of independence was applied to identify the relationship between the basic socio-demographic characteristics and use of herbal medicine, with the level of significance at 0.05.
The study revealed that herbal medicine use among under five years children is high (89.4%) in the county. Age of under-five children, education level, occupation, monthly income and location of residence of caregivers had significant relationship with the use of herbal medicine. The study revealed that herbal medicine were mostly used in the treatment of gastrointestinal diseases (26.2%), respiratory disorder (19.2%), skin diseases/trauma (16.4%) and Malaria (10.9%), the study also found that there is a strong belief in the potency of herbal medicine making its role in health care delivery significant. The most commonly used herbs were *Erythrina abyssinica* (35.1%) and *Amaranthus hybridus* (32.9%). Concomitant use of herbal medicines with conventional medication was reported by 50.2% of herbal users. Apart from treating illnesses, the need for supplement, growth improvement, and appetite improvement were other conditions contributing to the use of herbal medicines. Often, 70.2% of parents/guardians believed that since herbal medicines and supplements are promoted as natural, they are safe and less likely to cause side effects than prescription medication. The study recommends that the ministry of health should ensure that correct information on dangers of concomitant use of herbs with conventional medicine is disseminated to general public. Finally, the ministry of environmental and natural resources should ensure conservation of the very popular herbs for future generations.

### MALE PARTNER INVOLVEMENT IN PROMOTING SKILLED ATTENDANCE AT CHILDBIRTH IN MATAYOS SUB-COUNTY, BUSIA COUNTY, KENYA

**ROSELILIAN KHANALI ANDANJE-M.P.H**

**Department:** Community Health

**Supervisors:** Prof. Margaret Keraka

Dr. Gaudencia Okumbe

Male partner involvement in women's Reproductive Health has recently garnered considerable attention. Encouraging men to promote skilled attendance during delivery is a big step in increasing the proportion of births being attended by skilled professionals hence contributing to the achievement of Millennium Development Goal 4 and 5 which aim to reduce child mortality and improve maternal health respectively. In investigating for male involvement in promoting deliveries by skilled health professionals, this study specifically aimed at: (a) establishing the socio-economic, socio-cultural and demographic factors that would influence male involvement in promoting skilled attendance during delivery and (b) explore men's knowledge of delivery complications as a precondition for choice of place of delivery and choice of assistance during
delivery. In-depth interviews were conducted among males whose partners have recently given birth (0-2yrs) using a structured questionnaire. The study used descriptive research design with a target population of 200 men within the six villages of Matayos Sub-County. Secondary data was collected from the health facility records and review of the census report 2009, KDHS 2009 and KDHS 2014. Data was analyzed both quantitatively and qualitatively and results presented using frequency distribution tables and charts. A chi-square test was carried out with a p-value of <0.05 being considered significant. The study established that male involvement in promoting skilled attendance is beneficial to improving maternal outcomes. The main determinants of Male involvement in promoting skilled birth attendants were: age ($\chi^2 = 19.511, P = 0.003$); religion ($\chi^2 =13.446, P = 0.009$); marital status ($\chi^2 = 33.689, P = 0.000$); employment status ($\chi^2 =8.963, P = 0.0255$) and education level $\chi^2 =31.450, P = 0.000$. It was evident from the study that safety during delivery determines the choice of place of delivery. The study established that male partners were involved in taking care of their partners during pregnancy. Hence, recommended that programs should be introduced to reach males as well as females, not only with information and services to protect themselves and their partners, but also with messages regarding gender equity. Secondly the government should channel programs to the grassroots levels to enable those in rural areas access education on reproductive health and maternal health. They should also be freely allowed to accompany their partners to a facility in times of delivery.

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PREVALENCE AND RISK FACTORS FOR TRACHOMA INFECTION AMONG CHILDREN AGED 1-9 YEARS OLD IN OLDONYONYOKIE LOCATION, MAGADI DIVISION, KAJIADO COUNTY, KENYA

Christine Moraa Nyamwaro-M.P.H

Department: Environmental Health

Supervisors: Dr. Gaudensia Okumbe

Dr. John Paul Oyore

Trachoma is one of the water-related infectious diseases that affects the eyes and manifests itself in impoverished, rural areas with little access to clean safe water and proper sanitation that disproportionately afflicts women and children in poor communities. It is a bacterial disease caused by *Chlamydia trachomatis* that is highly infectious and can spread through an infected person’s hands or clothing or transmitted by flies that have been in contact with discharge or nose of an infected person. The disease remains the principal cause of preventable blindness and the second leading cause of blindness globally. The current recommended surgery for trichiasis, antibiotics for active disease, facial cleanliness, and environmental change to reduce transmission (SAFE) strategy targets all key elements believed to be necessary for a short- and long-term intervention program. Even with the interventions on the ground, the prevalence of trachoma is still high. The study investigated the prevalence and risk factors for trachoma infections among children aged 1-9 years old in Oldonyonyokie Location, Magadi Division, Kajiado County. Specifically the study sought to examine the prevalence of trachoma, assess socio-demographic factors influencing trachoma prevalence, identify water, sanitation and hygiene related factors influencing prevalence of trachoma, determine whether the practice of keeping of animals affect trachoma prevalence and assess the health seeking behaviors of care givers of children affected by trachoma. The study was a cross-sectional descriptive survey that employed both quantitative and qualitative approaches. Kajiado County was purposively sampled using multi stage cluster sampling methods in the first stage; secondly Oldonyonyokie
location was randomly selected. Thirdly snow ball sampling was used to select households with children aged 1-9 years old, guided by Community Health Workers (CHWs). Data was collected using interviewer administered structured questionnaires, focus group discussions (FGDs) and In-Depth Interviews (IDIs). Quantitative data was entered and analyzed using SPSS version 20, which was triangulated using qualitative data. Qualitative data was transcribed and analyzed by content analysis and presented verbatim. The results indicated that prevalence of trachoma is high (18.6%) in Oldonyonyokie, Magadi. Although this was lower than the greater Kajiado County, the prevalence was still an issue of public health concern. The main socio-demographic characteristic found to influence the prevalence of trachoma were the levels of formal education. Majority of the respondents had poor hygiene practices mainly manifested by poor latrine coverage of 11.6%, and hand washing (28.1%) after toilet use. Majority of the households kept cattle (50.9%), goats (82.6%) and sheep (57.4%) in the households, hence increasing the risk of transmission of trachoma. The results further indicated that majority of households’ health seeking behaviors was poor – with only 23.1% of respondents visiting health centers after having watery eyes. The study recommends that the Ministry of Health, at County and National levels, should come up with effective, tailor-made and sustainable ways of curbing the trachoma infections. There should be concerted efforts to promote the understanding of Trachoma prevention and management in affected communities. This could be undertaken through localized Behavior Change Communication (BCC) using Information, Education and communication (IEC) materials. There should also be special programmes aimed at improving the negative hygiene practices in the communities. Traditional practices such as keeping animals in the houses should be addressed so that the community is trained on behavior change.

RELATIONSHIP BETWEEN UMBILICAL CORD CARE FACTORS AND OUTCOMES AMONG NEONATES ATTENDING MERU TEACHING AND REFERRAL HOSPITAL, MERU COUNTY, KENYA

HIUHU ESTHER MUMBI-M.P.H

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Dr. Florence N. Okwara

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.
UTILIZATION OF POST NATAL CARE SERVICES IN KIAMBAA SUB-COUNTY, KIAMBU COUNTY, KENYA

NANCY MUGURE NJOKA-M.P.H

Department: Community Health

Supervisors: Dr. George Ochieng Otieno

Dr. Peter Mwaniki

Post Natal Care (PNC) has been demonstrated to reduce both the maternal and infants’ morbidities and mortalities; however, the uptake has been low. It is just about 51% of women in Kenya, who receive these services from a skilled health care worker. There has been little investigation of factors associated with the use of these services. The objective of the study was to determine factors that influence utilization of PNC services. Specifically, the study focused on the socio-demographic, health systems factors; and knowledge and attitude towards utilization of PNC services. A cross sectional descriptive study design was conducted among 399 mothers randomly selected from Kiambaa Sub-County. Mothers at household level were included in the study if they had a child aged < 1 years. Data was collected using structured questionnaire, focus group discussion, and key informant interview guides. Quantitative data was analyzed using Stata version 13, while qualitative data was analyzed based on themes. Relationships between variables were tested using chi square test and logistic regression and a p-value of <0.05 was considered significant. The average age of the women interviewed was 26 years (SD 4.9), with a median of 26.8 years. More than three-quarters (75.7%) of the respondents were married. Less than half (43.1%) of the women interviewed had secondary school education and majority of the women (67.4 %) had more than 2 children. Utilization of PNC services was 45.1%. The health care workers had informed only 15 % of the women, to attend the PNC services. The determinants of utilization of PNC services were having college education (OR=12.292, p=0.000); high household wealth status (OR=3.6211, p=0.000); formal employment (OR=2.705, p=0.008); delivery at a private facility (OR=2.9269, p=0.000) and high knowledge of PNC services (OR=2.2307, p=0.008). Perceived good quality of care (OR=5.2607, p = 0.000), and a positive attitude (OR=3.6507, = 0.000) were other determinants. There was low utilization of PNC services, influenced by level of education, household wealth index, delivery at a private facility, perceived good quality of services, good knowledge of services and a positive attitude. The government should enhance uptake of PNC services through community-based strategies; such efforts should target those with low education and economic status. The health care workers need to inform the clients about PNC services and schedule appointments. Qualities of services in the facilities need to improve.
DETERMINANTS OF CONTRACEPTIVE CHOICES AMONG HIV POSITIVE WOMEN OF REPRODUCTIVE AGE ATTENDING COMPREHENSIVE CARE CENTRE AT KITALE COUNTY REFERRAL HOSPITAL, KENYA.

CHERUIYOT EDWARD KIPLAGAT-M.P.H

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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 compare 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.

CLINICIANS USER SATISFACTION WITH PAPER-BASED PATIENT INFORMATION SYSTEM IN KENYATTA NATIONAL HOSPITAL AND MBAGATHI COUNTY HOSPITAL, NAIROBI, KENYA

ALICE WANJIKU KIMANI –M.Sc

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Supervisors: Dr. George Ochieng Otieno

Dr. Isaac Mwanzo

User satisfaction with paper-based information system is a subjective evaluation of the various individual, organizational, and societal consequences of information systems use. Despite the widespread use, the need to identify the extent to which clinicians are satisfied with the patient information systems in health institutions is still necessary. The purpose of this study was therefore to investigate the clinicians’ (doctors, dentists and clinical officers) user satisfaction with paper-based patient information systems in Kenyatta National Hospital (KNH) and Mbagathi County Hospital (MCH). The specific objectives were: To determine the proportion of clinicians who were satisfied, to determine the influence of user characteristics, to determine the organizational characteristics that influenced satisfaction and to determine the influence of
information quality to clinicians satisfaction. This was a cross sectional descriptive study. The two hospitals were purposively selected. The study employed stratified random sampling. Probability proportionate to size sampling of the clinicians was done and simple random sampling was done to identify the respondents. Data collection tools employing both quantitative and qualitative parameters were used in this study. Questionnaire was pre-tested in Mathari Hospital and thereafter refined accordingly. Data was obtained from 190 clinicians using self-administered questionnaires, FGDs and KI interviews to provide in-depth information. Data was analyzed by SPSS Version 16.0 and the results of the findings presented in form of figures and tables while association between variables was assessed using chi square statistics. The findings showed that clinician’s satisfaction was at 15.3%. Age ($\chi^2=42.079$, df=3, $p=.000$), years worked ($\chi^2=41.973$, df=4, $p=.000$), education ($\chi^2=4.518$, df=1, $p=0.034$), designation ($\chi^2=23.385$, df=3, $p=.000$) was statistically significant to clinicians user satisfaction. Overall organizational characteristics ($\chi^2=6.409$, df=1, $p=.011$) and information quality dimensions ($p< .01$) was statistically significant in relation to clinician’s user satisfaction. The study therefore showed need to address factors that contribute to very low clinicians’ satisfaction level with paper based patient information systems. Findings of this study will be used by policy makers to develop policy on information systems to ensure that clinicians’ requirements are met.
Diarrhoea remains the second leading cause of death in children under 5 years of age in sub-Saharan Africa. Health care seeking behaviour for diarrhoea varies by context and has important implications for developing appropriate care strategies and estimating burden of disease. The study examined how a diarrhoea episode is handled, as well as how other factors influence the home management and health seeking behaviour with regards to diarrhoea episodes in Langas and Huruma estates of Eldoret Municipality, Kenya. The objective of the study was to determine the factors influencing caretakers’ home management and health seeking behaviour with regards to diarrhoeal diseases among children under five years in Eldoret Municipality.

The study employed a descriptive cross sectional research design. The study target population consisted of 1,256 adult home caretakers and 35 officials from the Ministry of Health in Eldoret Municipality leading to total of 1,291 respondents. A sample of 377 households was selected through systematic sampling technique, where every 4th household was selected to participate. The researcher also employed systematic sampling technique to select the 11 county officials from the Ministry of Health. The researcher therefore selected the sample size of 388 respondents from the target population of 1,291 respondents. The study used both secondary and primary data. The secondary data was obtained from the records while the primary data was obtained from the respondents through questionnaires and interview schedule. Data collected was analyzed both quantitatively and qualitatively. The statistical package for social sciences (SPSS V.20) was used for data analysis. Descriptive statistics (frequencies, mean and percentages), chi square tests and regression were used in the analysis. P-value less than 0.05 were considered significant. The study yielded a response rate of 95.4% since out of 377 questionnaires that were given out, 360 (95.4%) were filled and returned. The study findings showed that majority of respondents 301(83.6%) agreed with the view that diarrhoea was a major problem among children under the age of five years in the region. It was found out that majority of the respondents 111(30.8%) identified poor hygiene and poorly disposed excreta-refuse as the main cause of diarrhoea among children in the region. It was also found from the study that all the respondents sampled were at least aware of the signs and symptoms of diarrhoea in children with majority of them correctly identifying the cardinal signs of diarrhoea. The study findings further showed that washing hands before eating/preparing food was the main measure to undertake when prevent children from contracting diarrhoeal diseases. The findings showed that a majority of respondents 107 (29.3%) use oral rehydration solution the immediate treatment measures for a sick child suffering from diarrhoea. The results indicated that there was a significant relationship between age (p=0.010) marital status (p=0.022), education level (p=0.011) and home
management of diarrhoea as these were socio-demographic factors associated with home management of diarrhoea. Occupation, age and education level were socio-demographic factors significantly associated with health seeking behaviour. Education was a significant factor influencing home management of diarrhoea \((p=0.013)\). Those with primary education were less likely to practice home management of diarrhoea compared to those with tertiary level (AOR; \(1-0.427=57\%\)). The researcher concluded that the prevalence of diarrhoea in the study areas is high and that it is a major problem among children under the age of five years. Efforts to educate the caretakers about the importance of seeking care and proper management of diarrhoeal and other childhood illnesses should be intensified.

SELF MEDICATION WITH ANTIBIOTICS PRIOR TO SEEKING TREATMENT AMONG ADULT PATIENTS ATTENDING OUTPATIENT DEPARTMENT AT GATUNDU SUB-COUNTY HOSPITAL, KIAMBU COUNTY, KENYA

CHARLES KIRAGU NGIGI-M.P.H

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Self-medication encompasses the use of the medicines by the users for self perceived health problems or the continuing use of medications formally prescribed earlier. The scope of the definition includes treatment of family members especially to minors and elderly. Self-medication with antibiotics is a global problem, the prevalence rates are high all over the world, up to 68\% in European countries while much higher in the developing countries with rates going as high as 92\% in the adolescents of Kuwait. A study done at Kenyatta National Hospital showed that 53.5\% of the respondents had practiced self-medication with antibiotics. Self-medication with antibiotics masks the signs and symptoms of underlying disease and hence complicates the problem, creating drug resistance and delaying diagnosis. The study explored the existence of SMA in the sub county and the antibiotics used. The study compares the prevalence of self-medication with antibiotics among patients in Gatundu Sub County with the results of other studies done elsewhere. The main objective of the study was to establish the extent of self-medication with antibiotics among patients seeking treatment at Gatundu Sub-County Hospital. The study was cross sectional. The sample size was 382 patients identified through stratified sampling, simple random and systematic random sampling technique drawn from the outpatient department. Data was collected from the outpatient department using an interview guide. Data was analyzed using SPSS (statistical package for social sciences). Descriptive statistics such as frequencies and percentages were used to analyze categorical data. Statistical significance level
was set at 0.05. The data is presented in pie charts, tables and bar graphs. The prevalence of self-medication with antibiotics was 48% prevalence which was lower than other studies done in Northern Nigeria (50.3%), Sierra Leone (68.9%), Ghana (70%), Uganda (65.1%) Sudan (76%), India (62.67%), and in Kenya at Kenyatta National Hospital, 53.5%. Those aged between 18-24 years had a proportion of 45.8% and those who had college/university education (45%). Males (35%) had a higher proportion than females (30.9%). Self-medication with antibiotics was significantly associated with age (p=0.0005) and lack of medical insurance cover (p=0.0198). Only 20% of the respondents had a medical insurance cover. Sixty percent of the respondents gave the reason for self-medication as cost cutting measure. The source of antibiotic was from community pharmacy (81%). Amoxicillin (36%) was the most used drug in self-medication with antibiotics. In conclusion self medication with antibiotics exists. Common source of antibiotics used in self-medication with antibiotics was community pharmacy. Respondents knew antibiotics dosage from pharmacy attendants. The study therefore recommends that health education interventions on self-medication with antibiotics practices should target people of all ages, sex, education and community at large. There is need to recruit more members to have a medical insurance cover. Community pharmacies should not dispense antibiotics without prescriptions to patients. Interventions to decrease self medication with antibiotics should emphasize on reducing access in obtaining antibiotics without prescription.

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 per cent. 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 ≤ 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.

THE RELATIONSHIP BETWEEN SCHOOL FEEDING PROGRAMMES AND UP TAKE OF CERVICAL CANCER SCREENING SERVICES AMONG HIV POSITIVE WOMEN IN DAGORETTI, NAIROBI CITY COUNTY, KENYA.

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Although cervical cancer is said to be the leading cause of cancer deaths among women in low resource settings, screening services in health facilities remains very low. The risk of death from this disease is higher among HIV positive women as a result of persistent Human Papilloma Virus (HPV) infection with quicker progression to cancer. As a result, screening services have been in cooperated in routine care of all HIV positive women, but uptake remains very low. This could be due to low levels of awareness on the importance of screening within our facilities. In addition, there could be other unaddressed barriers to utilization of these services. This study sought to determine whether the level of awareness, socio-demographic and economic factors and health facility factors affect uptake of cervical cancer screening services among HIV positive women in Dagoretti, Nairobi County. A descriptive cross sectional facility based survey using proportionate random sampling involving HIV positive women receiving care within HIV clinics was conducted. Data was collected using interviewer administered questionnaire and an observation checklist. Data analysis was performed using SPSS version 20 (IBM, USA). Chi-square test was used to establish comparisons between categorical variables. Associations between socio demographic and economic factors, level of awareness and health facility factors
with uptake of cervical cancer screening services were analyzed using correlation, binary logistic regression was conducted. Out of the interviewed respondents, 19% had screened for disease yet only 56% of those who had screened were as a result of a doctor’s recommendation. Most of those who had never screened (44%) feared to undress before a health care provider. A greater proportion (72%) had good knowledge levels on cervical cancer screening. Out of the six facilities, only 2 were well equipped for screening. Women with higher level of education (p=0.023), those aged above 45 years (p=0.003), those with current circumcised partner (p<0.0001) and those currently employed (p=0.0008) had good knowledge on screening services. Women aged 45 years and above were 2 times more likely to have been screened (OR 2.071; 1.115-3.847; P=0.021). Women with good knowledge are 2 times more likely to screen (OR2.2981, 1.062-4.973; P=0.035). Respondents with current circumcised partners are 3 times more knowledgeable (OR 2.935, 1.363-6.320; P=0.006) while those in formal education are 2.5 times more likely to have good knowledge (OR 2.537, 1.110-5.797; P=0.027). Findings of this study demonstrated that some socio demographic and economic factors affect uptake of cervical cancer screening services even with good knowledge levels. The information generated in this study might be valuable in informing cervical cancer managers and policy makers on policy review concerning cervical cancer screening and treatment in Dagoretti, Nairobi County and therefore consolidate the gains made in the control of this killer disease among HIV women.
SCHOOL OF HOSPITALITY AND TOURISM

FOOD SAFETY AND HYGIENE PRACTICES: A COMPARATIVE STUDY OF SELECTED TECHNICAL AND VOCATIONAL EDUCATION AND TRAINING AND UNIVERSITY HOSPITALITY SCHOOLS IN KENYA

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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 macêdione of vegetables (n=36) from these institutions were analysed in the laboratory to determine the microbial load, aerobic plate count and coliform. 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.
THE CONTRIBUTION OF SOAPSTONE HANDICRAFT INDUSTRY TO COMMUNITY TOURISM IN TABAKA, KISII COUNTY, KENYA

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Dr Geoffrey Masaki Manyara

Many countries in developing world have turned to tourism as a tool for sustainable development. Community participation is a crucial element to the success of tourism development. The level of success of tourism within a community is dependent upon the degree of resident’s involvement and participation. The purpose of this study was to assess the contribution of soapstone handicraft tourism industry in Tabaka in Kisii County. The objective of the study was to investigate the contribution of soapstone handicraft industry to the growth of tourism activities in Tabaka sub-location in Kisii County; the study employed a descriptive research design targeting soapstone operators and their leaders in Tabaka Sub-location. The sample for this study comprised of five group leaders purposively selected and 85 soapstone operators selected using stratified random sampling method from five soapstone self-help groups in Tabaka sub-location. Data were collected using a structured questionnaire and an interview schedule. Both quantitative and qualitative data were analysed separately and synchronized. Quantitative data was analysed using SPSS software. Qualitative data was analysed using thematic data analysis method then incorporated with quantitative data in presentations and discussions. The results of this study were presented using descriptive statistics such as frequency tables, figures and graphs while emerging themes were reported as reflected in the analysis. The response rate of 94% was achieved and deemed to be very good. The findings indicated that there was minimal tourism in Tabaka though majority of Tabaka residents were involved in making soapstone handicraft products largely consumed by tourists at different destinations in Kenya as souvenirs to carry home. Stakeholders played various roles where the government engaged in planning and policy development coordinated both private and public sectors but needed to do more especially in marketing and building of appropriate infrastructure. The industry faced challenges that arose from limited education of operators, limited funding, lack of infrastructure and exploitation by middlemen. However suggestions of strategies to overcome the challenges community residents faced were made as the need for the government involvement in creating awareness, to facilitate the acquiring of potential entrepreneurial skills, lack of modern tools and limited marketing knowledge of members, encouragement of stakeholder participation in providing the needed support, government commitment to the building of infrastructure and supper-structure and enhancing of marketing of Tabaka as a destination of choice. The study recommended a further research to explore the role of tour
planners in promoting Tabaka soapstone handicraft as one of cultural tourism products in western Kenya tourism circuit.
PERSONALITY TRAITS, POLITICAL EFFICACY AND ELECTORAL OUTCOMES: A SURVEY OF SELECTED FEMALE PARLIAMENTARY CONTESTANTS IN KENYA

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Dr. Jacinta Kwena

Personality traits and political efficacy judgments independently influence the types and the level to which people participate in political activities. All reviewed studies on the role of personality traits and political efficacy judgments in political participation were done in the West, and the Eastern countries. Studies on women’s political participation show that by November 2015, their global average stood at 22.6%, 23.4% in Sub Saharan Africa and accounted for 19% of legislators in Kenya. This study investigated effects of personality traits and political efficacy on electoral outcomes among selected female parliamentary contestants during 2007 general elections in Kenya. It used purposive and snowball sampling methods. Data was collected using the BFI and PES Scales. Descriptive statistics were used to analyse participant’s demographic information. A One-way ANOVA was used to examine differences while a Chi-Square was used to examine associations between successful and non-successful contestants. The participants mean age was 49.45, ranging from 25 to 68 years. Their personality traits distribution was 35.71% conscientiousness, 33.33% agreeableness, 21.43% extraversion, 9.52% openness and 0% neuroticism. The distribution of political efficacies was 54.76% internal, 2.38% external and 42.86% cynicism. Chi-Square results yielded no evidence for association between personality traits and electoral outcomes \( \chi^2 (2, n=42) = 1.367, p = .242 ; \) but, the distribution of traits among participants and their differences in personality traits across electoral outcomes showed that personality traits determine electoral outcomes. The study found a positive association between
external efficacy and electoral outcome $\chi^2 (2, n=42) = 8.04, p = .005$. An ANOVA yielded no significant difference in extraversion between successful ($M = 4.18, SD = 1.00$) and non-successful ($M = 0.519, SD = .519$) participants ($F (1, 40) = .984, p = .327$); no significant differences in neuroticism between successful ($M = 2.00, SD = .54$) and non-successful ($M = 1.99, SD = .533$) participants ($F (1, 40), .005, p = .946$); no significant difference in openness between successful ($M = 3.89, SD = .563$) and non-successful ($M = 3.72, SD = .734$) participants ($F (1, 40), .717, p = .402$). But, there was a significant mean difference in conscientiousness between successful ($M = 4.43, SD = .319$) and non-successful ($M = 4.05, SD = .54$) participants ($F (1, 40) = 7.232, p = .010$); and a significant difference in agreeableness between successful ($M = 4.03, SD = .266$) and non-successful ($M = 4.38, SD = .446$) participants ($F (1, 40) = 9.615, p = .004$). In political efficacy, it found a significant difference in internal efficacy between successful ($M = 3.956, SD = 1.525$) and non-successful ($M = 4.476, SD = .5063$) participants ($F (1, 40) = 10.69, p = .002$); a significant difference in external efficacy between successful ($M = 3.06, SD = .604$) and non-successful ($M = 2.603, SD = .7468$) participants ($F (1, 40) = 4.820, p = .034$); but, there was no significant difference in cynicism between successful ($M = 4.437, SD = .730$) and non-successful ($M = 4.14, SD = .712$) participants ($F (1, 40) = .919, p = .191$). In conclusion, the study found personality traits and political efficacy judgments as able to determine electoral outcomes. It was evident that external and internal political efficacy associated with electoral success and moderate the effect of personality traits. It is proposed that female political aspirants should seek personality assessment and counselling to enhance self-understanding, harness the strengths of their personality trait and manage its weaknesses and they should nurture personality traits and political efficacy judgements that enhance their connection and favour with the electorate.
CROSS-LINGUISTIC INFLUENCES ON FIRST LANGUAGE ACQUISITION OF OLUTACHONI LEXICON

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Dr. Maina Njiri

The study sought to identify lexical borrowing and describe the nature of lexical borrowing among the 2-7 year old children acquiring Olutachoni as their first language. The study also investigated and established the correlations between the age and gender of the children and the degree of lexical borrowing. The role of the linguistic environment to the acquisition of Olutachoni as a L1 was also investigated. The Usage-Based Acquisition Theory, Levelt’s Theory of Speech Production and the Unitary Language System Hypothesis were used to explain the role of the external and the internal mechanisms behind language acquisition. For a comparative analysis, data was collected from children in the mixed language family set up (Olutachoni-Olubukusu) and the single language family set up (Olutachoni-Olutachoni). This was meant to establish if cross linguistic influences from the mothers’ language (in this case Olubukusu) had any influence on the acquisition of Olutachoni. The study adopted a time-lag strategy design and a triangulation approach to collect and analyze data. Twelve children were purposively sampled from twelve homes through the social network approach. Unstructured interviews and observation schedules were used to collect and audio-record utterances from the 12 children. A contrastive and comparative analysis of the cases of lexical borrowing from the mixed language family set up and the single language family set up was done. Spearman’s Rank Correlation
Coefficient was used to measure the relationship between the age and gender of the children and the degree of lexical borrowing. The results were presented in the form of frequency tables and figures which were followed with explanations. The findings of the study revealed that there were cases of cross linguistic influences from Olubukusu and Kiswahili among the 2-7 year old children acquiring Olutachoni as a First language. The two main strategies of lexical borrowing which were manifested among the children were lexical inventions and lexical importation. The influences occurred among the children from both the mixed and the single language family set ups although at varying degrees. Lexical importation was manifested through loan words and loan adaptation strategies whereas prefixation was employed as the main word formation process during lexical invention. Children from the mixed language family set up recorded a higher percentage of lexical borrowing compared to those from the single language family set up. There was a strong negative correlation between the age and gender of the children and the degree of lexical borrowing. Also, the linguistic environment had an effect on the production of lexical borrowing during child language acquisition. It was recommended that other cross linguistic influence studies in other African languages be conducted in order to promote the development and use of indigenous languages as per Chapter 2 section 7(3b) of the 2010 Kenyan Constitution. Furthermore, parents, teachers and psychologists should view lexical borrowing arising from CLIs as a strategy towards language learning but not as forms of interference.
RELATIONSHIP BETWEEN SELECTED PERSONAL ATTRIBUTES AND OCCURRENCE OF VICARIOUS TRAUMA AMONG STAFF IN HOSPICES IN KENYA

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Supervisors: Dr. Beatrice M. Kathungu

Dr. Ann Merecia Sirera

Vicarious trauma is increasingly recognized as a global phenomenon which affects populations that are directly involved with suffering patients as is the case with staff in hospice settings. Hospice caregivers are constantly exposed to agonizing stories of trauma from patients and their families. This can trigger reactions in the caregiver similar to those experienced by the clients. Research findings indicate that there is a variation in the way caregivers react to vicarious trauma (VT). However, the few studies that have attempted to look at personal attributes that can put hospice caregivers at risk of developing VT have yielded equivocal results. Furthermore, some studies focused entirely on medics leaving out the other staff members who also could be at risk for VT. The current study therefore, aimed to determine the relationship between selected personal attributes namely: age, level of education, work experience, gender, personal trauma history, level of empathy; and occurrence of VT among hospice workers. Constructivist Self Development Theory (CSDT) guided the study. The study utilized a correlational research design. The study targeted all the 120 members of staff in the 21 hospices in Kenya. Random stratified sampling was used to select a total of ten hospices. The study sample comprised 70
members of staff (male and female) in the sampled hospices. Data was collected using four structured self-report tools namely: Brief Trauma History Tool, Vicarious Trauma Scale, Interpersonal Reactivity Index as well as an open-ended instrument. A demographic questionnaire was also included. Data was then analyzed using descriptive and inferential statistics. Correlations between selected personal attributes and occurrence of VT were done. Pearson’s correlation coefficient was used to analyze parametric data while chi square was used to test non-parametric data. The study findings revealed a prevalence rate of 67% of VT among hospice workers. Some of the personal attributes namely age, level of empathy and personal history of trauma had a significant positive relationship with the occurrence of VT [age: \( r(70) = .256, p = .032 \); personal trauma history: \( r(70) = .275, p = .021 \); level of empathy: \( r(70) = .256, p = .032 \)]. Other demographic variables including: gender, level of education, occupation and years of work experience were found to have no significant correlation with the occurrence of VT. Based on CSDT the study concluded that the self which is the seat of personality regulates the individual’s experience of trauma. The findings showed that vicarious trauma is a real threat to care givers working in hospices. The study recommended that there is need to educate caregivers about the existence and possible risk factors of vicarious trauma. It further recommended that, sound organizational interventions, prevention and psychosocial support programmes need to be developed to empower the caregivers so that they can enhance their self-capacities, as well as the wellbeing of the organization as a whole. These findings may guide the development of appropriate preventive strategies and interventions that target risks for development of VT.
RELATIONSHIP BETWEEN SELECTED CHILDHOOD PARENTAL FACTORS AND VICTIMIZATION TO INTIMATE PARTNER VIOLENCE AMONG MEN IN NYERI COUNTY, KENYA

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Intimate partner violence (IPV) is a prevalent problem that threatens the societal welfare both in developed and developing nations. Most efforts to alleviate it have focused on women victims of male perpetrated IPV. Despite increasing media reports of men experiencing IPV, there is paucity of information on the prevalence of such victimization and the risk factors associated with it especially in Kenya. This study sought to establish the relationship between selected childhood parental factors and intimate partner violence (IPV) among men in Nyeri County. The selected childhood parental factors included exposure to parental intimate partner violence, harsh physical parental disciplining and parental involvement. Based on social cognitive and the attachment theories, the study utilized an Ex post facto correlational design to establish the nature of associations between the independent and the dependent variables. The target population for the study was married or once married men in Nyeri County aged between 18 and 65 years. A multi-stage probability sampling was used to arrive at the sample. Four structured scales were used to collect quantitative data namely; childhood exposure to parental IPV scale, harsh parental discipline scale, parental involvement and IPV scales. Focus group discussions were used to collect qualitative data. Descriptive statistics were used to analyze the demographic
factors, prevalence and forms of IPV. Correlations between childhood parental factors and IPV were established using Pearson’s Product Moment correlation Coefficient. The study findings provided evidence that IPV against males in Nyeri County was prevalent with 87.9% reporting to have ever experienced some form of IPV. The study also revealed that there were significant positive relationships between experience of IPV and the following childhood factors; exposure to parental IPV and harsh parental disciplining. Paternal involvement had significant negative correlation to IPV except for the physical form of IPV. Maternal involvement was found to have insignificant negative correlation to IPV except for physical form of IPV. A major implication and recommendation of the study was that there is need for intervention programmes for male survivors of IPV to be initiated. Educating the public on how to identify male victims of IPV and the law enforcers on how to deal with them was also recommended. The study also recommended premarital education and counselling, couple counselling, and community awareness creation on issues related to IPV. Parental education was also recommended in an effort to promote parental involvement and prevent exposure of children to parental IPV and harsh physical disciplining. The male survivors of IPV, mental health professionals and parent educators as well as policy makers are among those who were expected to benefit from the study findings
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
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 (98%). 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.

THE EFFECTIVENESS OF OLGULULUI PREDATOR CONSOLATION SCHEME IN ADDRESSING HUMANPREDATOR CONFLICT IN AMBOSELI NATIONAL PARK, KENYA

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Dr. Francis .P. Kerre

The study provides in-depth understanding of human-predator conflict which involves livestock killing by wild animals (lions, leopard, hyena, cheetah and leopards) and the livestock farmer’s kill wild predators to secure their livelihoods. Globally and locally, human-predator conflict efforts to minimize conflicts included compensation for livestock losses, human death / injury and support to social development programs. Whilst acknowledging efforts made to address the human-predator conflicts, the problem remains unresolved over the years. Olgulului Predator Consolation Scheme was established in Olgulului group ranch in Amboseli ecosystem to compensate farmers for predated livestock; minimize rampant killing of wild predators; involve all stakeholders in enhancing proper livestock husbandry to reduce human-predator conflict. While the scheme objectives were sound, its effectiveness has not been systematically evaluated. The evaluation study’s overall goal was to assess the effectiveness of the Olgulului predator consolation scheme in minimizing livestock-predator conflict in the study area, with specific
OBJECTIVES TO; (a) Identify types and causes of human-predator conflict; (b) explore the positive and negative outcomes of the scheme; (d) establish challenges facing the scheme; (e) identify lessons learnt and best practices for enhancing the scheme effectiveness. The study employed qualitative methods of data collection and evaluation research design. The Secondary data was collected by desk reviews, journals, newspapers, reports and websites, while the primary data was collected through semi structured and Group Discussions interview schedules with open ended questions. Additionally, Multi stage sampling method was used to select 125 household heads {respondents} and was limited to persons aged 18 years and above. Informed consent was obtained from the respondents (participants) after explanation and clarification of the study objectives. Statistical Package for Social Sciences (SPSS) was used to analyze descriptive qualitative data and presented in graphs, charts and tables. Conflict and social exchange theories guided the study. The research findings revealed that the Olgulului predator consolation scheme had an effect on minimization of human-predator conflict in the study area because livestock owners were compensated and predator killing had reduced. The respondents however, expressed concerns on some challenges facing the scheme such as delayed compensation, inadequate compensation fee and unreliable funding sources. In conclusion, predator consolation scheme has proven effective in minimizing human-predator conflicts in the study area. The study recommended for reinstatement of government compensation for property and human deaths to enhance its financial sustainability.

ELEMENTS OF TRAGEDY IN SELECTED NOVELS OF NGUGI WA THIONG’O

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Dr. Paul M. Mukundi

This study investigates Ngugiwa Thiong’o’s use of tragedy as a method of literary representation in his rendition of postcoloniality. The study focuses on five novels; The River Between, A Grain of Wheat, Matigari, Petals of Blood, and Devil on the Cross. As its objectives, the study investigates: the various elements of tragedy used in his selected novels; the use of tragedy in the emplotment and representation of thematic concerns in these novels; and the use of the tragic form as an expression of wa Thiong’o’s postcolonial vision in the selected novels. The study interrogates the presentation of characters, their narrative world, and the conflicts that these
characters represent. The ideas that these characters espouse stir the conflicts that wa Thiong’o highlights through these novels and contribute to the literary signification of the postcolonial discourse. With close analysis of key novelistic features such as narrative plot and structure, representation, characterisation, motifs, and point of narration, the study interrogates how wa Thiong’o uses tragedy not only as a means of evaluating the different causes of tragic conflicts but also as a means of proposing avenues for entrenching both ideological and a literary discourse in response to these tragic conflicts. In its analysis of the selected texts, the study uses tenets of postcolonial criticism and tragic realism to facilitate its evaluation of not only the narrative structure but also the novels’ discourse. The study uses descriptive analysis of the selected novels to qualitatively interrogate them in line with the study’s objectives.

THE CENTRALITY OF MARRIAGE IN AFRICAN RELIGIO-CULTURE WITH REFERENCE TO THE MAASAI OF KAJIADO COUNTY, KENYA

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Supervisors: Prof. Mary Getui
Dr. Zacharia Samita

The study explored Maasai religio-cultural beliefs, the place of marriage in Maasai cultural and religious beliefs, to what extent Maasai cultural and religious beliefs are related to and manifested in Maasai marriage and the changes affecting Maasai marriage with regard to the religio-cultural themes. This research was guided by a thematic approach to the study of African religio-cultural knowledge and specifically by analysing the topic through the matrix of fifteen religio-cultural themes. The fifteen religio-cultural themes articulate in a systematic manner the beliefs of African Religion which are entwined and embedded in African religio-cultural knowledge, giving that knowledge a special sacral and personal dimension. The aim of this work
was to explore the central role played by marriage in African religio-culture with a focus on the Maasai of Kajiado County, Kenya. The study set out to investigate if marriage manifests culture and religion and if the Maasai have a rich, persistent cultural marriage heritage with many of the historical, cultural and religious practices still largely intact and influential despite the many challenges it faces in the contemporary world. The study was exploratory in nature and adopted both qualitative and quantitative approaches. It was implemented through gathering data from members of the Maasai ethnic community in Kajiado District now Kajiado County. The sampling units considered were the number of households (96,621), the average population per division (58,000) and the total Kajiado Maasai population (464,883) as presented in the Kajiado District Strategic Plan 2005 – 2010. Primary data was collected through surveys while secondary data was collected through library research. Four sets of research instruments were used in gaining access to the primary data for the study. These were questionnaires, interview schedule, observation checklist and focus group discussion guide. The data was then analyzed using both qualitative and quantitative techniques within the purview of the research questions and fifteen African religio-cultural themes: God, Ancestors, Living Dead, Nominal Reincarnation, African Lineage, Leadership, Adulthood/Elderhood, Bridewealth, Marriage, Polygyny, Herbalist, Diviner, Witch, Witchcraft and Death. Quantitative data was summarized and presented using graphs, charts and frequency tables. This was done to exemplify main trends that were derived from certain concrete responses. Qualitative data was analyzed through content analysis. This exercise involved classifying data into key themes, patterns and relationships. Propositions and conclusions were then made based on the apparent patterns of relationships within the data. The data of this study shows that Maasai marriage manifests and reflects Maasai religio-cultural themes. The main findings corroborated, in a large way Kirwen’s theory of the fifteen themes of
African Religio-Cultural Knowledge. The study recommends that in order to find sustainable solutions to challenges facing Maasai marriage, it is best to look carefully into Maasai marriage with regard to Maasai religio-cultural themes.

EFFECTS OF EUCALYPTUS PLANTATION ON SOIL PHYSICO-CHEMICAL PROPERTIES IN THIRIRIKA SUB-CATCHMENT, KIAMBU COUNTY, KENYA.

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Trees are very important in Thiririka sub-catchment of Kiambu County in Kenya for reasons such as income generation, soil and water conservation, biodiversity conservation, charcoal production, erosion control, among many others. **Eucalyptus** spp. (*E. grandis*, *E. saligna* and *E. globulus*) remain part of the dominant tree species planted in the Thiririka sub-catchment. Although these species are planted in various spatial patterns in the sub-catchment to meet the demand for fuel wood, building construction, timber, electricity poles, water conservation, charcoal production and erosion control, and cushion farmers when the markets for their agricultural produce fail or are low, reports such as drying up of water courses, affecting the soil physico-chemical properties, tendency to deplete soil nutrients and fertility, suppression of other vegetation, reduction of forest biodiversity and reducing crop yield in agro-forestry systems have been made. Although a number of reports have been made in other countries concerning the negative impact of **Eucalyptus** spp. plantation on edaphic characteristics of soils, few studies have been done in Kenya on the implications of **Eucalyptus** spp. on the soil physico-chemical properties. This study was therefore, carried out to assess the effects of **Eucalyptus** spp. plantations on selected soil physical and chemical properties in the Thiririka sub-catchment. Two experimental plots (monoculture **Eucalyptus** spp. plantation and native forest of mixed vegetation) of 100 m x 100 m (1 ha) each were used for the study. Each experimental plot was sub-divided into five sub-plots of 20 m x 20 m for soil and litter sampling. All soil samples were collected at a depth of 0-20 cm using screw soil auger. Soil analyses were done using standard methods. Statistical analysis of the data collected was done using SPSS 17.0 statistical software and Microsoft Excel 2010. The results from the **Eucalyptus** spp. plantation were compared to those from the native forest within the same catchment and conclusions regarding the soil fertility level were drawn based on internationally acceptable standards. The results obtained in the study indicated that **Eucalyptus** spp. plantation significantly affects the soil moisture (26.6 %). Soil bulk density under **Eucalyptus** spp. plantation (1.16 g cm\(^{-3}\)) was within acceptable range. Also, the results showed that cultivation of **Eucalyptus** spp. significantly lowered the soil pH (4.8), leading to a significant decline in soil total nitrogen (0.09 %) and soil total organic carbon (0.83 %) concentrations. Decomposition of the litter of **Eucalyptus** spp. also caused increase in concentration of soil exchangeable acidity (0.32 c mol Kg\(^{-1}\)), soil exchangeable sodium (0.52 c mol Kg\(^{-1}\)), Fe concentration (95.28 mg kg\(^{-1}\)), immobilization of soil available...
phosphorus (concentration of P was 23.2 mg kg\(^{-1}\)) rendering it unavailable for plant use. However, in the study, no significant differences were found between the *Eucalyptus* spp. plantation and the control native forest in terms of soil exchangeable Mg, Ca and K, cation exchange capacity and effective cation exchange capacity although, concentrations of the exchangeable Mg, Ca and K and effective cation exchange capacity were low, which possibly contributed to the increased soil acidity, exchangeable acidity and Mn and Fe concentrations observed in the soils under the *Eucalyptus* sp. plantation. Furthermore, the *Eucalyptus* spp. plant litter fall concentrations of total N (1.05 %) and total P (0.15 %) were lower compared with the native forest, where concentrations of total N and total P were 2.11 and 0.17 %, respectively. The study demonstrated that sole cultivation of *Eucalyptus* spp. had the tendency to lower soil fertility and so it is advisable to interplant *Eucalyptus* spp. with other leguminous species, in addition to good agronomic practices such as nitrogenous and phosphate fertilizer application to replenish loss of the essential soil nutrients such as N and P associated with *Eucalyptus* spp. planting and also to ensure sustainability of *Eucalyptus* spp. cultivation on the soil resources.

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

RONOH LEONARD KIPROTICH-M.A

**Department:** Geography

**Supervisors:** Prof. Joy Obando

Dr. Shadrack Murimi

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.

**ANALYSIS OF HOUSEHOLD WATER DEMAND, DISTRIBUTION AND COMMUNITY MANAGEMENT STRATEGIES IN NYANGORES SUB-CATCHMENT, BOMET COUNTY, KENYA**

**KOECH JOHN CHERUIYOT-M.A**

**Department:** Geography

**Supervisors:** Prof. Chris Shisanya

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.

THE AKAMBA LAND TENURE SYSTEM AND ITS IMPACTS ON WOMEN’S LAND OWNERSHIP IN MASINGA DIVISION, 1895-2010.

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Department: History, Archaeology & Political Science

Supervisors: Dr. Susan Mwangi

Dr. Pius Kakai

This thesis looks at the Akamba land tenure system and its impact on women’s ownership of land in masinga division. The research acknowledges the critical importance of land reform in Kenya as a country that inherited colonially structured and unequal land ownership patterns. However, there are limits to state-led, masculinised and politicized land reform when women, as gendered subjects in government policies and as a social category are not considered in theory and practice of land reform programme. The research employs patriarchy and gender as a tool of analysis theories to investigate the objectives, driving forces and the politics of land reforms, to establish the extent to which the reforms initiated between 1895-2010 created economic spaces for women and to suggest policy recommendations not only for land reform reconstruction but also agrarian development in Kenya. Whereas land reform was necessary in the context of highly
unequal land ownership and poverty, this research provides information on how land reform programme diminished opportunities for women to be empowered and shrunk the democratic spaces for genuine participation of women in the development process by denying them rights to land and widening gender inequalities. The objectives of the research are: to investigate women’s right to land during the pre-colonial period; to interrogate the impact of colonialism on women’s ownership of land in Masinga division; to interrogate the impact of land tenure reform on women and to explore the relationship between land tenure system and food security. The research was based on the premises that colonialism impacted negatively on women’s ownership of land and that subsequent independent governments did little to address this. The study adopted qualitative research design to collect data, formulate vital principles of knowledge and analyze data on land reforms. This involved the collection and analysis of data. The snowballing technique was used for identifying special cases for in-depth interviews. The study established that structural changes brought about by land tenure reforms have eroded the traditional laws that guaranteed women’s right to land. This is so, despite new tenure laws that allow women regardless of marital status to own land. The research findings further indicates that the women farmer has no titled land of her own and has to depend on her husband’s land for her food farming. Lack of security denies her the freedom to make major decisions concerning the land. It is this sense of insecurity of tenure which affects women’s investment decisions, since the owner of the land has the ultimate legal authority over land use. The research recommends that the government should consider passing legislation that makes it mandatory for married couples to register their land jointly upon marriage. Further to this, there should be a multi-agency deliberate attempt to support women in challenging discriminatory aspects of customs and practice of patriarchy which limits women’s ownership of land.


JONATHAN KABIRU KARIUKI – M.A

Department: Philosophy and Religious Studies

Supervisors: Dr. Margaret G. Gecaga

Dr. Zacharia W. Samita
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
EFFICACY OF INFORMATION TECHNOLOGY IN PROTECTING PERSONAL AND BUSINESS DATA IN NAIROBI COUNTY, KENYA

ANDREW GITAU KIMANI-M.A

Department: Institute of Peace and Security Studies

Supervisors: Dr. Casper Masiga

Dr. Buchere Philip Brightone

The need for the identification of all persons in all jurisdictions in the world has become universal. However, the loss of identification documents whether through criminality or negligence has major security implications not only for the individual but also to entities that have perpetuities. Studies have shown that these challenges can be solved by embracing modern technology which many countries including Kenya are yet to achieve. This study examined the factors that limit the integration of Information Technology Communications (ICT) in the protection of personal and business documents and proposes measures that should be taken towards its integration. The study targeted a population of 150 individuals from the Kenya Police (KP), Kenya Data Network (KDN) and Kenya Revenue Authority (KRA) from which a sample of 110 respondents was selected. The survey design applied both qualitative and quantitative research methods to collect and analyze primary and secondary data. Self-administered questionnaires were distributed to the respondents using simple random sampling. Semi-structured interviews were also used to collect primary data. Secondary data was collected through reviewing information from previous related studies. The Statistical Package for Social Sciences (SPSS) was used for quantitative data while meaning condensation and categorization were used for qualitative data analysis. The study revealed that lack of an integrated ICT system
is a challenge in tracking missing identities or even verifying the validity of provided information thus compromising the productivity and security of businesses and institutions. Results from this research study highlight the role of integrated ICT systems in enhancing the tracing of missing identity documents and in making corrections on inaccurate personal data.

**REPRESENTATION OF ECOLOGICAL CONSCIOUSNESS IN HENRY OLE KULET'S VANISHING HERDS AND THE HUNTER**

SAMSON MALEYA LUSINGA – M.A

**Department:** Literature

**Supervisors:** Dr. MugoMuhia

Dr. J.K.S.Makokha

This study endeavours to bring a fresh insight into the role of literature in the global campaign against environmental degradation. It examines how human culture impacts the natural environment in Henry Ole Kulet’s novels: *Vanishing Herds* and *The Hunter*. The study engaged the critical tools of postcolonial ecocriticism in the analysis of the author’s conceptualization of nature, the relationship between colonialism and ecology, and the impact of culture on how characters’ experience, perceive, and relate to nature. The study employs a qualitative research methodology based on close textual reading of the selected primary texts as the principal means of data collection and analysis. The collection of secondary data for the study involves a meticulous library research for relevant books, scholarly journals, dissertations, essays, and newspaper articles from both print and the internet. This study contains five chapters. Chapter one is an introduction that offers the study’s conceptual background. Chapter two is a critical analysis of the author’s representation of the natural world in *Vanishing Herds*. Chapter three attempts to investigate the ecological ramifications of modernity and British colonialism and relate it to the environmental challenges depicted in *Vanishing Herds* and *The Hunter*. In Chapter four, the study examines the representation of characters’ ecological consciousness in *Vanishing Herds* and *The Hunter*. The final chapter offers a summary of the study’s key findings, conclusions and recommendations. Findings from the study revealed a significant correlation between culture and the way people perceive and relate to the natural environment. The study also revealed a link between British colonialism and some of the environmental challenges experienced in the post-colonial Kenyan state. The study recommends the recovery and
restoration of indigenous ecological ethics embedded in local cultural practices and beliefs that were debased and discouraged under colonialism.

PATTERNS AND EFFECTS OF WOMEN’S ALCOHOL CONSUMPTION ON FAMILY COHESIVENESS IN KIRINYAGA COUNTY, KENYA

MATHENGE TERESIA WANGECI-M.A

Department: Gender and development Studies

Supervisors: Dr. Pacificah Okemwa

Dr. Casper Masiga

The study investigated the patterns and effects of women’s alcohol consumption on the family in Kirinyaga West Constituency in Kirinyaga County, Kenya. It was guided by the following objectives; to identify patterns of alcohol consumption among women, establish factors that motivate women to excessive alcohol consumption, investigate the effects of excessive alcohol use by women on the family and identification of possible ways of addressing the problem in Kirinyaga West Constituency. The study adopted Caroline Moser’s gender roles concept and the family systems theory advanced by Kerr and Bowen. Descriptive research design was used on 114 women aged 19-45 years, residents in 25 villages in the area under study. The multi stage cluster sampling technique was used to draw a sample of 5 villages and thereafter from each, snow balling was used to select a sample of 25 women who indulged in alcohol consumption. Convenience sampling was used to select 20 men from the sampled villages and seven key informants who included a D.O and 6 sub chiefs in the region under study used in Focus Group Discussions. Data was collected using two sets of instruments; an interview guide and focus group discussion guide. The instruments were validated and their reliability proven, while a pilot study was conducted in a village that was not included in the study. Data was analyzed through descriptive statistics using the computer package SPSS. Quantitative data was presented in form of pie charts, bar graphs, frequency tables and percentages whereas qualitative data was analyzed into themes and patterns. The study established that majority of the women consume alcohol at home, major consumption time was at night and triggers of alcohol consumption in women were financial, work, physiological and gender related. Major effects of alcohol consumption on the family were such as divorce, violence, neglect of parenting roles, engagement in risky sexual behavior and contracting of HIV/AIDS. The study recommended employment of community based methods to enable the community to work out their own gender inclusive ways of reducing alcohol consumption, equitable distribution of labour amongst all members of the family,
addressing alcohol availability and accessibility, sensitization on the dangers of alcohol addiction and the application of poverty reduction methods within families.

MANAGEMENT PRACTICES OF IRRIGATION WATER AND THEIR EFFECTS ON WATER ALLOCATION AMONG FARMERS IN KILADEDA SUB-CATCHMENT, TANZANIA

KHATIB MWADINI-M.Sc

Department: Geography

Supervisors: Dr. Shadrack K. Murimi

Prof. Joy A. Obando

Irrigated agriculture plays a major role in the livelihoods of Kiladeda sub catchment, Pangani Basin, Tanzania. However, the sub catchment is experiencing a problem of inequitable distribution of irrigation water among farmers. The challenge is escalated by rapid population growth, economic growth, other water users and irrigation management practices. This situation has increased conflicts and insufficiency in irrigation particularly in downstream of the river. This study aimed at assessing the management practices of irrigation water and their effects on water allocation among farmers in Kiladeda sub-catchment, Tanzania. Specifically, the study analysed socio-economic factors influencing irrigation water demand; examined irrigation management practices adopted by farmers and their effects on irrigation water demand; investigated irrigation water demand and allocation among farmers and evaluated strategies used to mitigate irrigation water demand and allocation disparities among farmers. The study
employed both primary and secondary data. The primary data were collected by interviewing 150 farmers, key informant interviews and measurement of river discharge while secondary data were collected from relevant institutions in Moshi, Tanzania. Numerical tools for data analysis comprised of descriptive statistics, independent sample t-test, stepwise regression, content analysis and WEAP model. The stepwise regression results showed that farm location and farm size (13.5%); income and farm location (19.8%) and; farm ownership, education level and income (39.6%) were the predictors of irrigation water demand for the whole river, upstream and downstream zones respectively. On the other hand, all nine factors in the middle stream zone were eliminated by the model. The study also revealed that furrow irrigation (86.7%) and plastic buckets (13.3%) were the main irrigation techniques employed by farmers in the sub catchment. However, there was no significant difference between irrigation techniques adopted and irrigation water demand in the sub catchment (p >0.05). On the contrary, there was a significant difference between irrigation water demand and irrigation techniques in upstream zone of the sub catchment (p <0.05). The results of WEAP model revealed that the sub catchment has water shortage of about 53% of the total irrigation water required. The current annual irrigation water demand is 18.44Mm³ and unmet demand is 9.8Mm³. Both water demand and unmet demand are expected to increase twice in 2020. The high water demand for irrigation could be the main cause of excessive water abstraction in the upstream and downstream zones of the sub catchment. Moreover, the study identified water pricing, formation of water users associations, public education, reduction of farm sizes, changing crop types, water rights as well as laws and regulations on water allocation, as the main strategies implemented to reduce water demand and allocation conflicts. The study found that despite of water shortage in the sub catchment, water was not used efficiently for irrigation activities. Therefore, the study recommends partnering
approach to improve irrigation water management; reviewing of laws, regulations and water rights to conform to the current irrigated areas and irrigation water requirements. More so, extension services to farmers should be improved. This will serve as a source of information and training forum for farmers on irrigation water management practices and therefore enhance efficient use of water for irrigation.

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

APINDI JANE AKOTH-M.A

Department : Geography
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Dr. Kennedy Obiero

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; Orechromis (r = .260), Lates niloticus (r = .130) and Protopterus (r = .184), however, Rasrinoebola 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.
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 (*Rhizophora mucronata, Bruguiera gymnorrhiza, 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. Apis mellifera was the most dominant flower pollinator for Bruguiera gymnorhiza, Ceriops tagal and Avicennia marina. Hypotrigona gribodoi was predominantly found on RM and is potentially the flower pollinator of this species. Higher number of Apis mellifera 721 (32.2%) was recorded in 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. 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.
OPTIMIZATION OF IN VITRO REGENERATION AND GENETIC TRANSFORMATION PROTOCOL FOR SELECTED BANANA AND PLANTAIN (Musa spp.) CULTIVARS AND GENERATION OF TRANSGENIC BANANA RESISTANT TO BACTERIAL XANTHOMONAS WILT

KAHARIRI ESTHER WANJA-Ph.D

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Supervisors: Dr. Steven Runo
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Banana and plantain (Musa spp.) are important staple food crops for rural and urban consumers and provide a source of income for resource poor farmers in the humid tropics of sub-Saharan Africa. However, banana production is severely limited by both biotic and abiotic factors. Application of conventional breeding for both disease and pest resistance has resulted only in limited success due to the long generation times and the high sterility and triploidy of most cultivated bananas and plantains. Genetic transformation offers an alternative and viable means for crop improvement. However, to be successful, these applications require a rapid and efficient plant regeneration and transformation protocol for both banana and plantain. Currently, most transformation protocols for banana use cell suspension cultures. Establishing cell suspension cultures is a lengthy process, highly cultivar-dependent and most farmer-preferred banana and plantain cultivars are recalcitrant to generation of embryogenic cell suspensions. The objective of this study was to optimize a genetic transformation protocol for banana and plantain cultivars using meristematic tissues and to develop transgenic plants tolerant to BXW. Multiple bud
clumps and intercalary meristematic tissues of 10 cultivars (Grande naine, Gross Michel, Gonja Manjaya, Nusu Ngombe, Ngombe, Mpologoma, Uganda green, Kayinja, Zebrina and Calcutta 4) were co-cultivated with \textit{Agrobacterium} strain EHA105 harboring a binary vector pCAMBIA2301 or modified pCAMBIA2300-GFP, followed by selection and regeneration of kanamycin-resistant plantlets. Results of this study indicated 5mg/L as the optimal concentration of cytokinin for multiple bud induction. Several parameters affecting transformation efficiency were explored in this study. The optimal acetosyringone concentration was 200 μM and 100 μM for multiple bud clumps and intercalary meristems respectively), optimal infection time (30 minutes and 10 minutes for multiple bud clumps and intercalary meristems respectively), optimal vacuum infiltration time (2 minutes and 5 minutes for multiple bud clumps and intercalary meristems respectively), effect of explant type (multiple bud clumps had a higher transformation efficiency, 10%, compared to intercalary meristems, 7%), optimal sonication time (2 seconds for multiple bud clumps) and combined optimal sonication time and vacuum infiltration time was reported to give a higher transformation efficiency (12%) compared to sonication and vacuum infiltration a lone. Uniform GFP expression was observed after the fifth sub culture. The presence and integration of the \textit{nptII} and \textit{gusA} genes in the progenies were confirmed by PCR and Southern blot analysis, respectively. Transformation efficiency of banana cultivar Mpologoma with hypersensitive response assisting protein (\textit{Hrap}) gene was 8%. Out of the twenty lines expressing \textit{Hrap} gene screened for \textit{Xanthomonas} wilt resistance resulted in four resistant lines, five partial resistant and eleven susceptible lines. This study augments the ongoing genetic improvement of banana and plantain and contributes to the food security of communities living in Africa and relying on banana as a staple food.
CYCLE INDICES, SUBDEGREES AND SUBORBITAL GRAPHS OF $PGL(2, q)$

ACTING ON THE COSETS OF ITS SUBGROUPS

STANLEY KIPLAGAT ROTICH-Ph.D

Department: Mathematics

Supervisors: PROF. I. N. KAMUTI

DR. JANE RIMBERIA

The action of $PGL(2, q)$ and $PSL(2, q)$ on the cosets of their subgroups is a very active area in enumerative combinatorics. Most researchers have concentrated on the action of these groups on the cosets of their maximal subgroups. For instance Tchuda computed the subdegrees of the primitive permutation representations of $PSL(2, q)$. Kamuti determined the subdegrees of primitive permutation representations of $PGL(2, q)$. He also constructed suborbital graphs corresponding to the action of $PGL(2, q)$ on the cosets of $D_{2(q-1)}$. However many properties of the action of $PGL(2, q)$ on the cosets of its subgroups are still unknown. This research is mainly set to investigate the action of $PGL(2, q)$ on the cosets some of its subgroups namely; $C_{q-1}, C_{q+1}, P_q, A_4, A_5$ and $D_{2(q-1)}$. Corresponding to each action the disjoint cycle structures, cycle index formulas, ranks and the subdegrees are computed. To obtain cycle index formulas we use a method devised by Kamuti and for the subdegrees and the ranks we use a method proposed by Ivanov et al. which uses marks of a permutation group. For the action of $PGL(2, q)$ on the cosets of $C_{q-1}$ the subdegrees are shown to be $1^2$ and $(q - 1)^{(q+2)}$ and the rank is $q + 4$. For $P_q$ the subdegrees are $1^{(q-1)}$ and $q^{(q-1)}$ and the rank is $2(q - 1)$. Suborbital graphs for $PGL(2, q)$ acting on the cosets of $C_{q-1}$ are constructed and their properties analysed. We have established that the number of self paired suborbits is $q + 2$ and the paired suborbits are 2. Also suborbital graphs corresponding to suborbits whose elements intersect $\{0, \infty\}$ at a singleton have been shown to be of girth 3. Suborbital graph corresponding to the suborbit containing $(0, \infty)$ is found to be of girth 0. Finally suborbital graph corresponding to suborbit with representative of the form $(1, \beta^i)$ is shown to be of girth 4.
Diarrheal diseases are the commonest manifestation of food poisoning, which are fatal. Knowledge, attitude and practice of food handlers influence the occurrence of food poisoning. *Staphylococcus aureus* is considered the third most important cause of food-borne diseases in the world after *Salmonella* species and *C. perfringens*. Antimicrobial resistance and enterotoxigenic properties of *S. aureus* in food of animal origin in many parts of Kenya are scanty. The aim of the study was to investigate food handlers’ perception on food safety and characterization enterotoxigenic *S. aureus* in foods of animal origin in Nairobi Kenya. A cross-sectional descriptive study was conducted in Nairobi and its environs, confined to meat and milk outlets. In the first stage of the study on food safety, food handlers (n=100) were interviewed and questionnaire administered to assess their knowledge, attitudes and practices (KAP). In the second phase, food samples of animal origin (n=420) were randomly purchased from different outlets. Additional 251 samples of various pork products from a meat processing plant were collected for isolation and characterization of enterotoxigenic properties of *S. aureus*. Colonies of *S. aureus* were selected from Baird-Parker medium plates for identification using the biochemical tests. Reverse Passive Latex Agglutination was used to identify enterotoxigenic strains. Gene distributions were detected by multiplex Polymerase Chain Reaction (mPCR) reaction. Their resistance to eight commonly used antibiotics was determined using Kirby-Bauer disc diffusion test. Results on Knowledge, Altitudes and Practices showed that overall scores were not significantly affected by marital status and religion of the respondents. Gender comparisons revealed that the mean KAP scores for men and women food handlers were similar. A total of 251 (37.4%) of *S. aureus* strains were isolated and identified. The proportions of contamination of animal products from the seller and meat processing plant were comparable. The contamination rate of the meat and meat products sample (40.7%) was significantly higher than milk and milk products (25.0%) (p=0.001). Most of the strains 187 (74.5%) produced staphylococcal enterotoxin (SE) with staphylococcal enterotoxin A (SEA) being the most
frequent (90, 48.1%), followed by a combination of SEA and SEC (22, 11.8%). Most frequent gene detected by multiplex PCR was sea (61.8%). Genes see, sed, sec, and seb were observed in 33.3%, 17.5%, 15.9% and 13.9% strains, respectively. Combination genes found to occur in pairs were Seal/See (21.2%), Seal/Sed (9.8%), Sed/See (2.1%), Seal/Sec (0.7%) and Seb/Sec (0.5%). A combinations of four genes sea/sec/sed/see accounted for only 0.01%. Relatively low number (2.1%) of discrepancies between multiplex PCR and Reverse Passive Latex Agglutination (RPLA) assay particularly on SED. The results of both methods were identical concerning SEA, SEB and SEC. All of the strains showed multi drug resistance (MDR) to major classes of antibiotics tested with Penicillin G having the highest resistance level (246, 99.6%) followed by Ampicillin (230, 93.1%). The study concluded that knowledge attitude and practice performance seemed to improve along the level of education and work experience. High level of contamination of foods of animal origin by enterotoxigenic and MDR strains of S. aureus was evident. The study indicates a need for good hygiene practices in food processing, in order to minimize staphylococcal food poisoning, which poses a health risk for the consumers.

PREVALENCE, SUSCEPTIBILITY PATTERNS AND RISK FACTORS ASSOCIATED WITH Staphylococcus aureus PRESENCE IN MARKETED MILK AND MILK PRODUCTS WITHIN NAIROBI CITY COUNTY, KENYA

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Staphylococcus aureus is a major food-borne pathogen that poses a serious threat to public health. In Kenya, with the continuous water shortage, proper sanitary conditions are not sufficiently met and hence pre-disposing the community to S. aureus infections. One of the difficulties of controlling S. aureus food poisoning is that food can contain a very high population of the bacteria without being noticeably identified. It has been suggested that food-borne diseases represent one of the most widespread and overwhelming public health problems in poor resource settings. The increasing rate of multidrug resistant S. aureus has continued to pose a challenge to the pharmaceutical firms and patients management. The aim of this study was therefore to determine the presence of S. aureus in milk and milk products, antimicrobial susceptibility patterns and factors associated with food contamination. A total of 334 samples were collected for analysis in the laboratories. A loop-full of each sample was streaked directly on MacConkey agar and Blood agar. Suspected isolates were subcultured in Mannitol salt agar which was used as an indicator media. Sensitivity test was accomplished using Muller-Hinton agar. Biochemical tests; Catalase test and Coagulase test were used as confirmatory tests for S. aureus. To determine antimicrobial susceptibility, panels of selected antibiotics commonly used in empirical treatment of S aureus infections were obtained from different classes. The antibiotics were Penicillin G, Erythromycin, Vancomycin, Chloramphenicol, Tetracycline, Gentamycin, Methicillin and Ciprofloxacin. From all the 54 samples of raw milk analyzed, 35
(64.81%) samples were contaminated by *S. aureus*. In pasteurized milk, out of 112 samples, 23 (20.54%) samples were contaminated while in yoghurt, out of 112 samples, 12 (10.71%) samples were contaminated. In ice cream, out of 56 samples, 2 (3.57%) were contaminated. All isolates were found to be 100% sensitive to Tetracycline, Ciprofloxacin, Erythromycin and Methicillin. Resistance to Penicillin G was occasionally observed across the different sources of milk and milk products. From the milk outlets selling raw milk within the study area, regular opening of the containers to sell milk pre-disposed the milk to hand contamination and consequently greater risks of contamination by environmental contaminants. Out of 120 respondents interviewed, an average of 84 (70%) claimed to be aware of the health risks associated with milk. Of the respondents, 28 (23%) claimed to be aware of diseases associated with consumption of contaminated milk. Most of them claimed to have encountered stomach disorders and diarrhea while others claimed to have experienced body rashes, severe headache and vomiting. On average, 8 (9%) of the respondents claimed to have contracted a disease as a result of drinking contaminated milk within the last one year. It was established that 118 (98%) of food handlers did not receive any formal training regarding food hygiene. Information generated from the study provides a basis upon which formulation of better policies regarding raw milk and milk products can be based on. In addition, given the imminent risks of infection and resistance involved, the relevant authorities should adopt severe inspection measures in order to regulate or prohibit the informal sale of milk.

**GEOPHYSICAL PROSPECTION OF IRON-TITANIUM OXIDE (ILMENITE) USING MAGNETIC METHOD IN MAGAONI, KWALE COUNTY, KENYA.**

**ODUOR GEORGE OTIENO-M.Sc**

**Department:** Physics

**Supervisors:** Dr. Willis J. Ambuso

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.

OPTICAL AND ELECTRICAL CHARACTERIZATION OF ZnSe-Cu$_x$O$_y$ THIN FILMS FOR SOLAR CELL APPLICATIONS

CHOGE HILLARY KIRWA-M.Sc

Department: Physics

Supervisors: Dr. Walter K. Njoroge

Dr. Zakayo M. Mapelu

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$_x$O$_y$ 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$_x$O$_y$ 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$_x$O$_y$ 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$_x$O$_y$-ZnSe exhibit photovoltaic behaviour and are suitable for solar cell applications. Further research to improve the cell efficiency is recommended.
SCREENING FOR ANTIBACTERIAL AND ANTIFUNGAL COMPOUNDS IN Bersama abyssinica FRESEN

ONG’ERA TABITHA NYANCHOKA-M.Sc

Department: Chemistry

Supervisors: Prof. Alex K. Machocho
Prof. Nicholas K. Gikonyo

Medicinal plants contain a wide range of substances that can be used to treat chronic illness as well as infectious diseases. A vast knowledge of how to use the plants against different illnesses may be expected to have accumulated in areas where plants are commonly used. Conventional medicine has created problems due to microbial resistance. This has enhanced the interest in search for natural products with medicinal property. Information on the chemical constituents in herbs aid in discovering new therapeutic drugs. Bersama abyssinica was selected for this study because of its uses in traditional medicine as an antimicrobial agent. For example, the bark, root, and leaf decoctions are taken to treat a range of stomach disorders such as abdominal pain, colic, diarrhoea, intestinal worms and amoebiasis. A stem bark decoction is drunk to cure cancer and rheumatism. The overall objective of this study was to extract, isolate and characterize bioactive compounds with antibacterial and antifungal activities in Bersama abyssinica. Crude extracts of the stem bark was bioassayed for antibacterial and antifungal activities. Column chromatography, thin layer chromatography and vacuum liquid chromatography were used for separation, isolation and purification of the extracts. Spectroscopic techniques were used to elucidate their structures. Six compounds were isolated which include: β-sitosterol (TN4), β-stigmasterol (TN3), β-sitosterol glycoside (TN2), lupeol (TN5), oleanolic acid (TN6) and an anthraquinone [Bersamanone] (TN1). From the isolated compounds, five have been previously reported in literature while Bersamanone is reported for the first time from this plant species. The bacteria used to test for antibacterial activities included Salmonella typhi, Shigella dysentriae, Vibrio cholerae, Escherichia coli, Klebsiella pneumoniae, Pseudomonas aeruginosa, Staphylococcus aureus and Bacillus subtilis while the antifungal test was carried out against Candida albicans and Penicillium notatum. Dichloromethane extract of the stem bark had mild activity of 8 and 9 mm on Bacillus subtilis and Staphylococcus aureus, respectively. Ethyl acetate extract had moderate activity of 10 and 10 mm on Staphylococcus aureus and Bacillus subtilis. It had mild activity on the other strains of bacteria. Antifungal activities of this extracts were also mild on Candida albicans and Penicillium notatum. Methanol extract had the highest activity of 16 and 16 mm on Klebsiella pneumoniae and Pseudomonas aeruginosa, respectively. Moderate activity was shown in Vibrio cholerae, Escherichia coli, Bacillus subtilis and Staphylococcus aureus. Among the compounds isolated β-sitosterol glucoside had activity against all the strains of bacteria and fungi the highest being that of B. subtilis and E. coli with inhibition zones of 14 and 15 mm, respectively. The anthraquinone had activity against Bacillus subtilis, Pseudomonas aeruginosa, Staphylococcus aureus and Escherichia coli with inhibition zones of 14, 9, 14 and 10 mm, respectively. Lupeol had moderate activity against Bacillus subtilis, Staphylococcus aureus and Escherichia coli with inhibition zones of 11, 14 and 8 mm, respectively. The study showed that the studied plant species contain compounds that showed
varied bioactivities on the test bacteria and fungi and can be used in treatment of the diseases caused by respective pathogens used in this study once cytotoxicity tests are done.

CORRELATION BETWEEN HIGH DENSITY LIPOPROTEIN CHOLESTEROL AND KIDNEY FUNCTION IN TYPE 1 DIABETES MELLITUS AS A PREDICTOR OF DIABETIC NEPHROPATHY IN HUMAN SUBJECTS

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Diabetic nephropathy (DN) is a common microvascular complication occurring five years from onset of type 1 diabetes mellitus, leading to renal failure and death. It is characterized by albuminuria and a reduced glomerular filtration rate. Although much emphasis has been placed on screening for albuminuria and estimated glomerular filtration rate (eGFR) to predict or diagnose DN, less attention has been focused on the role of high density lipoprotein cholesterol (HDL-C) in risk assessment of DN onset. The aim of the present study was to evaluate the association between HDL-C levels and the markers of kidney functions, urinary albumin creatinine ratio (UACR) and eGFR, in patients with type 1 diabetes mellitus. In total, 89 type 1 diabetic mellitus patients attending Kenyatta National Hospital were recruited. A questionnaire was administered to ascertain age, gender, marital status, education level, family history of kidney disease and the diabetes duration. The following parameters were measured: blood pressure, body mass index, UACR, eGFR, total and HDL cholesterol. Data analysis was done using SPSS version 20.0. Chi squared test was used to analyse categorical variables of states of UACR, HDL-C and eGFR against the demographic and clinical risk factors. While for analysis of between group continuous variables, t test, one way ANOVA and Pearson correlation statistics were applied. The values of UACR, HDL-C and eGFR levels in the study population ranged from 3–300 mg/g, 0.45–3.45 mmol/l and 29.1–240.5 ml/min/1.73m², respectively. The number of participants with abnormal levels of UACR, HDL-C and eGFR were 45%, 14%, and 22%, respectively. The UACR and HDL-C values were significantly associated with the risk factors of: duration of diabetes, systolic and diastolic blood pressure (p < 0.05). The confounding factor of marital status was only significantly associated with UACR levels. On the other hand eGFR was not associated with any of the patients tested characteristics (p > 0.05). The HDL-C values were significantly lower in the subjects with albuminuria compared to normoalbuminuric group (p = 0.001). There was no significant association or correlation between HDL-C and eGFR values (r = 0.029; p > 0.05). Therefore, eGFR does not add predictive value of diabetic nephropathy among patients with type 1 diabetes mellitus. However, there was a significant inverse correlation between HDL-C and UACR level (r = -0.394; p < 0.05). Therefore, HDL-C has the potential to alternately predict the development of nephropathy levels among patients with a long standing case of type 1 diabetes mellitus.
ASSESSMENT OF HUMAN EXPOSURE TO NATURAL SOURCE OF RADIATION ON THE SOIL IN TONGAREN CONSTITUENCY OF BUNGOMA COUNTY, KENYA

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Radionuclides are unstable nuclei with high ratio of proton to neutron. Natural activities like volcanic eruption and anthropogenic activities expose originally concealed radioactive elements in the rocks within the earth crust. Poor agricultural practices such as excessive use of fertilizers add radioactive elements in the soil. Transport agents like run-off water and rivers, spreads these radionuclides within the soil in Tongaren Constituency. The radionuclides disintegrate to form lighter atoms by emitting radiations like alpha, beta and gamma rays. Gamma rays penetrate in to human tissue causing cancer, tumor, fibroites and lens opacification. The greatest effect of radiations was felt during Nagasaki and Hiroshima bomb where more than 40,000 people lost life in 1945 (Murray et al., 2000). Tongaren constituency is situated between latitude 00°34’00’’ N and longitude 34°34’00’’ E. The increasing cases of cancer has been an issue of global concern and with little information on the level of radionuclides in Tongaren constituency this research is conducted out to find out whether the soil is safe for human being. Agriculture being a major source of income in Tongaren the use of inorganic fertilizers containing radioactive elements, in maize production may lead to gradual accumulation of radionuclides. When radionuclides accumulate beyond the threshold level they pose danger to health of human being. This study determined the concentration levels of radionuclides in Tongaren constituency of Bungoma county. Twenty samples of soil were collected from maize plantation areas. Three adjacent soil samples were mixed up from each sampling point to get twenty representative (composite) soil samples. The soil samples were dried at 110°C, grounded and sieved through wire mesh of diameter 0.5mm and packed in plastic beaker that were sealed to prevent leakage of radon. The soil samples were kept for 28 days for secular equilibrium to be reached between the activity of uranium, thorium, potassium, radium and their progeny. The activity concentration level for ²²⁶Ra, ²³²Th, ²³⁸U and ⁴⁰K in soil samples were determined using gamma ray spectrometer with NaI (Tl). The average activity concentration for ²³²Th, ²³⁸U and ⁴⁰K was found to be 85.0±4.3 BqKg⁻¹ within the range (13.1-212.4), 260.3±13.0BqKg⁻¹ within the range (34.6-484.8) and 981.5±49.1 BgKg⁻¹ within the range (9.7-2178.5) respectively. The average radium equivalent activity was found to be 456.4±22.8 BqKg⁻¹ while external and internal hazard indices were found to be 1.24±0.06 and1.94±0.10 respectively. According to European commission, (1999), values of index Hₑ≤ 2 corresponds to a dose rate criterion of 0.3 mSv y⁻¹, whereas 2≤ Hₑ ≤ 6 correspond to 1.0 mSv y⁻¹ and hence the hazard values are insignificant. The average dose rate was found to be 206.4±10 nGyh⁻¹ within the range 36.4±1.8 nGyh⁻¹ to
360.7±18 nGy h⁻¹ which was below the hazard limit of 1500 nGy h⁻¹. The annual effective dose rate was found to be 0.63±0.03 mSv y⁻¹ within the range 0.11±0.01 mSv y⁻¹ to 1.11±0.06 mSv y⁻¹. These health hazard parameters were below the safe limit of 1.0 mSv y⁻¹ since the maximum limit for annual effective dose rate is 1.0 mSv y⁻¹ (UNSCEAR, 2001). These results reveal no significant radiological health hazards for inhabitance within the study areas.

HETEROTIC GROUPING OF SELECTED INBRED LINES OF MAIZE (Zea mays L.) USING TWO TESTERS IN KIAMBU AND EMBU COUNTIES, KENYA

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Dr. Philip Leley

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 placed 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.

**PLASMA INTERFERON-GAMMA, INTERLEUKIN-10 AND ADIPONECTIN LEVELS IN HIV-1 AND TUBERCULOSIS CO-INFECTED INJECTION DRUG USERS AT BOMU HOSPITAL, MOMBASA, KENYA**

**KIBOI NATHAN-M.Sc**

**Department:** Biochemistry and Biotechnology

**Supervisors:** Dr. David Mburu  
Dr. Tom Were  
Dr. Gerald Juma

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.

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

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Department: Chemistry

Supervisors: Dr. Harun Mbuvi

Dr. Margaret Ng’ang’a

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.

ISOLATION AND IDENTIFICATION OF ANTIMICROBIALS FROM ERYTHRINA EXCELSA BAK

OMBUNA NAFTAL M.-M.Sc

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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 micro-
organisms 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.
CHEMICAL AND MINERAL ANALYSIS OF RAW AND ACID-TREATED CLAYS
FROM KANO PLAINS, KISUMU COUNTY, KENYA

OSWAGO MOSES OWINO-M.Sc

Department: Chemistry

Supervisors: Prof. Naftali T. Muriithi
Dr. Harun M. Mbuvi

Clays are aluminosilicate minerals which are widely spread in the earth’s crust. They also naturally contain iron because of its high relative abundance of about 6.5%. They have many applications such as, use in manufacture of Portland Cement, ceramic products such as bricks, roofing tiles and high quality ceramic products as crockery. For the manufacture of high quality ceramic products, the level of iron in the clays should not exceed 1%. This study was done on clays of Kano plains, Kisumu County, Kenya to find out the elemental and mineral composition of the clays with special interest on levels of iron since it affected clays’ use in making high quality ceramics. Further investigation was done on whether iron levels, if found to be high, would be lowered by mineral acids of different concentrations at different temperatures to improve clay quality for manufacture of high quality ceramics. Powdered raw clay samples dried at 105°C for six hours in a desiccator, digested or pelleted were analysed by AAS, EDTA titrations and XRF for elemental composition, and by XRD and IR for mineral composition. The samples were then treated with mineral acids of different concentrations at room and boiling temperatures for 12 hours to remove as much iron as possible and the residual clay washed, dried and analysed for Fe, Al and Si contents. The percentage elemental composition for the raw clays by AAS were expressed as oxides and ranges of identified elements found to be 45.47±0.18 to 64.70±0.10 SiO\(_2\), 12.54±0.37 to 17.95±0.19 Al\(_2\)O\(_3\), 3.74±0.08 to 10.28±0.06Fe\(_2\)O\(_3\), 0.44±0.01 to 1.17±0.01 MgO, 0.56±0.02 to 2.34±0.01 CaO, 2.07±0.013 to 11±0.08 K\(_2\)O, 0.98±0.1 to 1.86±0.01 Na\(_2\)O, 0.92±0.02 to 2.49±0.01 TiO\(_2\), 0.02±0.01 to 0.25±0.01 MnO and LOI of 9.77±0.15 to 15.40±0.10. The minerals in the raw clays, identified by XRD included Montmorillonite \((\text{Ca,Na})_0.3\text{Al}_2(\text{Si,Al})_4\text{O}_{10}(\text{OH})_2\cdot\text{xH}_2\text{O}\), Kaolinite \(\text{Al}_2\text{Si}_2\text{O}_5(\text{OH})_4\), muscovite, \(\text{KAl}_2(\text{Si}_3\text{Al})\text{O}_{10}(\text{OH,F})_2\), Albite, Na(AlSi\(_3\)O\(_8\)), Orthoclase KAlSi\(_3\)O\(_8\) and Dickite \(\text{Al}_2(\text{Si}_2\text{O}_6)(\text{OH})_4\).

Acid-treated clays gave different mineral composition and saw Montmorillonite, Kaolinite, Muscovite and Quarts detected in raw samples disappearing completely, and Ilmenite \((\text{Ni}_{0.25}\text{Zn}_{0.25}\text{Mg}_{0.25})\text{TiO}_3\) and \((\text{Ni}_{0.5}\text{Mn}_{0.5})\text{TiO}_3\), the titanium ore, Microcline KAlSi\(_3\)O\(_8\) and Calcite, CaCO\(_3\), emerging after acid-treatment. The findings showed levels of iron reduced by minerals acids from average 8.25% to less than 1% achieved by boiling clays with 6-8 M sulphuric acid. The levels of aluminium were lowered sparingly from 15.9% to 13.7% while levels of silicon remained unchanged. Second finding was that acid treatment alters mineral composition and cause interconversion of the clay minerals. Further, mineral composition given by chemical formulae showed that iron in the clays was not in the mineral structure and existed as an accessory component. The findings led to the conclusion that iron levels in raw clays were high but were lowered to less than 1% by mineral acids which improved their quality for making high quality ceramics. Data analysis was done by SPSS software.
PHENOTYPIC CHARACTERIZATION AND GENETIC DIVERSITY STUDIES OF SELECTED RICE (ORYZA SATIVA L.) POPULATIONS BASED ON AROMA AND COOKED KERNEL ELONGATION

Wambua Festus Kioko –M.Sc

Department: Biochemistry and Biochemistry

Supervisors: Dr. Mathew Piero Ngugi
Dr. Geoffrey Muriira Karau

Rice (Oryza sativa L.) is the main staple food for more than half of the world’s population. Improving cooking and eating quality of rice is one of the important objectives of many plant breeding programs. Aroma and cooked kernel elongation are two critical parameters that determine the market value, cooking and eating qualities of rice. The objective of this study was to evaluate the phenotypic and genetic diversity of thirteen (13) Oryza sativa L. populations from Kenyan and Tanzanian. Genetic diversity was determined using 8 simple sequence repeats (SSR) markers. Phenotypic diversity was determined based on measurement of seven (7) grain and kernel traits. Diversity data was analyzed using Minitab 17.0 and Power Marker version 3.25 software packages (North Carolina State University). The number of alleles per locus ranged from 2 to 4 alleles with an average of 3.12 across 8 loci. The polymorphic information content (PIC) ranged from 0.2920 (RM 282) to 0.6409 (RM 339) in all loci with an average of 0.4821. Pair-wise genetic dissimilarity coefficients ranged from 0.1125 to 0.9003 with an average of 0.5312. Maximum genetic similarity was observed between Kilombero and Supa, BS 370 and BS 217. Minimum genetic similarity was observed between Kahogo and BS 217. Cluster analysis was used to group varieties by constructing dendrograms based on SSR data and morphological characterization of grains. The dendrogram based on SSR data formed two distinct clusters of the 13 rice varieties. RM 339 and RM 241 were the most informative markers and could be used for differentiating rice varieties from diverse geographical origins. The results obtained from this study demonstrated that phenotypic trait measurement and use of trait specific SSR markers can be relied upon in diversity studies among diverse and closely related genotypes. RM 339 and RM 241 markers are recommended for use in diversity studies and in quality assurance for grading of rice varieties. Further analysis should be carried out using a larger number of samples and markers to come up with a more conclusive report on the discriminating power of microsatellite markers based on rice grain quality traits.
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.

**GROWTH PERFORMANCE AND PHYTOCHEMICAL PROFILES OF *Prunus africana***

**SAMPLED FROM MUGUGA, KOBUJOI AND KARURI, KENYA**

Nyamai Dorothy Wavinya-M.Sc

**Department: Biochemistry and Biotechnology**

**Supervisors: Dr. Marion Burugu**

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*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)- stigmaster-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)- stigmaster-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

**DIVERSITY, SYMBIOTIC EFFICIENCY AND EFFECT OF WATER HYACINTH COMPOST ON POPULATION OF RHIZOBIA NODULATING \(Phaseolus\ vulgaris\) IN LAKE VICTORIA BASIN**

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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 gene pool 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.

**ANTINOCICPTIVE ACTIVITIES OF ACETONE LEAVES EXTRACTS OF Carissa spinarum AND Caesalpinia volkensii IN MICE**

Joseph Kiambi Mworia-M.Sc

**Department:** Biochemistry and Biotechnology  
**Supervisors:** Dr. Mathew Piero Ngugi  
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Despite the progress that has occurred in recent years in the development of therapy, there is still a need for effective and potent analgesics for pain. Pain is defined as unpleasant feeling essential for body's defense system. Pain is managed using analgesics such as aspirin, paracetamol, diclofenac, morphone, opioids, among others. Conventional antinociceptives are expensive and have many side effects. Continued use of these drugs may lead to tolerance. Medicinal plants have been used to relieve pain and form a better alternative. Herbal antinociceptives are affordable and have arguably fewer side effects. *Carissa spinarum* (Linn) is used to treat rheumatoid pain,
fever and inflammation related disorders. *Caesalpinia volkensii* (Harms) has pharmacological activities that include antimicrobial, immune modulatory properties and antimalarial. These two plants are used locally by people in Embu County as analgesics. This study was designed to bioscreen the acetone leaves extracts of *C. volkensii* (Harms) and *C. spinarum* (Linn) for antinociceptive potential. The plant parts 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 solvent acetone in the ratio 1:2. Swiss albino mice were divided into five groups of five mice each: Normal, negative, reference and experimental group. Pain was induced experimentally using formalin and acetic acid. The experimental groups were treated with 50 and 100mg/kg dose quantities of each plant extracts prepared. The acetone leaves extracts of the two plants were evaluated for antinociceptive properties in mice compared to the reference drug diclofenac sodium. Mice were injected intraperitoneally with doses of the herbs, diclofenac and the vehicle. Thirty minutes later the animals were injected with 0.01ml of 2.5 % formalin in the sub planter region of the left hind paw and the other set with 0.4ml of 5% acetic acid. The total time spent lifting; biting, licking the paw and writhing were counted and scored. The acetone leaves extracts lowered paw licking time in a dose dependant manner. The leaf extracts of *C. volkensii* at the dose levels of 50 and 100mg/kg body weight reduced the formalin-induced pain in mice by 72.74% and 99.38 % respectively and acetic acid writhing by levels of 50 mg/kg body weight reduced the number of writhes by 81.40%, 100 mg/kg body weight did not reduce writhing. *C. spinarum* at the dose levels of 50mg/kg and 100mg/kg body weight reduced formalin induced pain by 3.47% and 34.46 and 20.2% and 95.50 respectively. Acetic acid induced pain in mice by 73.77 % and 86.89 % respectively. Diclofenac reduced the pain by 15.34 in early phase and 98.02% in late phase. Further, the phytochemical screening results showed that the acetone
leaves extracts of *C. volkensii* (Harms) and *C. spinarum* (Linn) have phytochemicals associated with anti-nociceptive activities. The study has established that the acetone leaves extracts of *C. spinarum* (Linn) and *C. volkensii* (Harms) are effective in management of pain. It is therefore recommended that further fractionation of the metabolites of the two plant extracts be carried out with a view to identifying the most active compounds for further development into drugs for management of pain and inflammation.

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

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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 possess’ 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.

PHENOTYPIC AND GENETIC DIVERSITY STUDIES ON SELECTED RICE (Oryza sativa L.) GENOTYPES BASED ON AMYLOSE CONTENT AND GELATINIZATION TEMPERATURE

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Rice cooking and eating qualities are mostly determined by the grain’s starch content which is composed of amylose and amylopectin. Amylose content is regarded as the most important indicator in classifying rice varieties in terms of starch content. Waxy gene located on chromosome 6 codes for Granule Bound Starch Synthase (GBBS) enzyme which is involved in biocatalysis of amylose synthesis in rice endosperm. In addition, amylopectin content influences gelatinization temperature in rice. Alk gene located on chromosome 6 codes for soluble Starch Synthase II (SSII) enzyme involved biocatalysis of amylopectin. Accurate evaluation of these two traits is difficult and has hindered development of better varieties with good eating and cooking qualities by rice breeders both in Kenya and Tanzania. The aim of the study was to carry out phenotypic characterization and genetic diversity studies on selected rice (Oryza sativa L.)
Genotypes from Kenya and Tanzania based on amylose content and gelatinization temperature using microsatellite markers. Measurement of 7 grain and kernel traits were determined among 13 rice genotypes studied. Genetic diversity based on amylose content and gelatinization temperature was studied using 8 microsatellite (SSR) markers tightly linked to major QTLs controlling these two traits. Furthermore, presence or absence of waxy and alk genes was determined using markers tightly linked to these two genes. Minitab 15.0 and Power marker version 3.25 softwares were used to analyze the data. A dendrogram was constructed from data set of mean values of grain and kernel traits and showed two super clusters; I and II. The number of alleles per locus ranged from 2 to 4 with an average of 2.75 alleles across 8 loci. The polymorphic information content (PIC) values ranged from 0.2920 (RM 202) to 0.6841 (RM 141) in all 8 loci with an average of 0.4697. Pair-wise genetic dissimilarity coefficients ranged from 0.9003 to 0.2201 with an average of 0.5627. Maximum genetic similarity was observed between R 2793 and BS 17, Supa and IR 64, R 2793 and ITA 310, Saro 5 and ITA 310, Saro 5 and R 2794. Minimum similarity of was observed between Wahiwahi and BW 196, IR 64 and BW 196. The dendogram based on cluster analysis by microsatellite polymorphism grouped 13 rice genotypes into 2 groups effectively differentiating Kenyan and Tanzanian rice genotypes based on amylose content and gelatinization temperature. The waxy gene was amplified in 5 rice genotypes while alk gene was amplified in all the rice genotypes studied. The results obtained suggested that grain and kernel traits measurements and use of SSR markers tightly linked to genes or Quantitative Trait Loci (QTLs) controlling these two traits could effectively be utilized for diversity analysis among diverse rice genotypes.

ASSESSMENT OF HUMAN EXPOSURE TO NATURAL SOURCE OF RADIATION ON THE SOIL IN TONGAREN CONSTITUENCY OF BUNGOMA COUNTY, KENYA

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Supervisors: Dr. Nadir O Hashim

Dr Merenga A Sarroney

Radionuclides are unstable nuclei with high ratio of proton to neutron. Natural activities like volcanic eruption and anthropogenic activities expose originally concealed radioactive elements
in the rocks within the earth crust. Poor agricultural practices such as excessive use of fertilizers add radioactive elements in the soil. Transport agents like run-off water and rivers, spreads these radionuclides within the soil in Tongaren Constituency. The radionuclides disintegrate to form lighter atoms by emitting radiations like alpha, beta and gamma rays. Gamma rays penetrate in to human tissue causing cancer, tumor, fibroites and lens opacification. The greatest effect of radiations was felt during Nagasaki and Hiroshima bomb where more than 40,000 people lost life in 1945 (Murray et al., 2000). Tongaren constituency is situated between latitude 00° 34’ 00’’ N and longitude 34° 34’ 00’’ E. The increasing cases of cancer has been an issue of global concern and with little information on the level of radionuclides in Tongaren constituency this research is conducted out to find out whether the soil is safe for human being. Agriculture being a major source of income in Tongaren the use of inorganic fertilizers containing radioactive elements, in maize production may lead to gradual accumulation of radionuclides. When radionuclides accumulate beyond the threshold level they pose danger to health of human being. This study determined the concentration levels of radionuclides in Tongaren constituency of Bungoma county. Twenty samples of soil were collected from maize plantation areas. Three adjacent soil samples were mixed up from each sampling point to get twenty representative (composite) soil samples. The soil samples were dried at 110°C, grounded and sieved through wire mesh of diameter 0.5mm and packed in plastic beaker that were sealed to prevent leakage of radon. The soil samples were kept for 28 days for secular equilibrium to be reached between the activity of uranium, thorium, potassium, radium and their progeny. The activity concentration level for $^{226}$Ra, $^{232}$Th, $^{238}$U and $^{40}$K in soil samples were determined using gamma ray spectrometer with NaI (Tl). The average activity concentration for $^{232}$Th, $^{238}$U and $^{40}$K was found to be 85.0±4.3 BqKg$^{-1}$ within the range (13.1-212.4), 260.3±13.0BqKg$^{-1}$ within the range (34.6-484.8) and 981.5±49.1 BgKg$^{-1}$ within the range (9.7-2178.5) respectively. The average radium equivalent activity was found to be 456.4±22.8 BqKg$^{-1}$ while external and internal hazard indices were found to be 1.24±0.06 and1.94±0.10 respectively. According to European commission, (1999), values of index $H_e \leq 2$ corresponds to a dose rate criterion of 0.3 mSvy$^{-1}$, whereas $2 \leq H_e \leq 6$ correspond to 1.0 mSvy$^{-1}$ and hence the hazard values are insignificant. The average dose rate was found to be 206.4±10 nGyh$^{-1}$ within the range 36.4±1.8 nGyh$^{-1}$ to 360.7±18 nGyh$^{-1}$ which was below the hazard limit of 1500 nGyh$^{-1}$. The annual effective dose rate was found to be 0.63±0.03 mSvy$^{-1}$ within the range 0.11±0.01 mSvy$^{-1}$ to 1.11±0.06 mSvy$^{-1}$. These health hazard parameters were below the safe limit of 1.0 mSvy$^{-1}$ since the maximum limit for annual effective dose rate is 1.0 mSvy$^{-1}$ (UNSCEAR, 2001). These results reveal no significant radiological health hazards for inhabitance within the study areas.
SPECIES COMPOSITION AND INFECTION RATES OF MOSQUITOES AND SAND FLIES IN MRIMA HILL, KWALE COUNTY, KENYA

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Mrima hill in Kwale County, along the Kenyan coast, is known to have high natural background radiation caused mainly by 232 Thorium (Th). Currently, the area also has no proper sanitary disposal system and people use bushes as toilets. There are no fresh water bodies. Despite other parts of the coastal regions of Kenya having been studied for human disease vectors including mosquitoes and sandflies, no studies have been carried out in Mrima hill to establish the prevalence of these important vectors. The main aim of the present study was to determine mosquitoes and sand flies species diversity as well as vector infection rates in order to establish the level of risk of infection with malaria and leishmaniasis for the local inhabitants. The relationship between radiation and population sizes of both mosquitoes and sand flies was determined. This study also established the relationship between levels of radiation and elevation. Thirty eight houses were randomly selected and radiation levels taken using hand held Digilert 100 CPMS reader and recorded. Mosquitoes and sand flies were caught using light traps and counted to establish their population. Species identification was done on mosquitoes and sand flies using standard taxonomic keys. All captured female insects were dissected and examined for presence of parasites to establish the infection rates. Data were analyzed using the Statistical Package for Social sciences (SPSS) Version 20 (2011) utilizing Chi-square and Pearson correlation. A total of 131 mosquitoes and 39 sand flies were captured. Apart from the Aedes aegypti species (1.9%), the only other species of medical importance that were collected in the study area included: Culex pipiens (69.42%), Cx vansomernae (1.5%), Mansonia africana (18.32%) and M. uniformis (9.6%). None of these mosquitoes are known vectors of disease in Kenya. Phlebotomine sand fly species that were collected included Sergentomyia bedfordi
(74.36%), *S. suberecta* (15.35%), *S. meilloni* (5.12%) *S. schwetzii* (2.56%) and *S. inermis* (2.56%). None of these species has been indicated to be of any medical importance in Kenya. The highest radiation level recorded was 17.5 milliSieverts/year whereas the lowest was 5.9 mSv/year; with a mean radiation of 10.52 mSv/year. There was no significant relationship between radiation levels and number of mosquitoes ($\chi^2 = 103.7$; df = 99; P = 0.353) or sandflies ($\chi^2 = 40.0$; df = 55; P = 0.936) collected. There was no significant relationship between the number of mosquitoes and sand flies ($\chi^2 = 36$ and P=0.165). In addition, there was no correlation between radiation levels and elevation ($r = -0.389$; df= 10; P=0.211). From the results of this study it can be concluded that it is unlikely that the insect-borne diseases can occur in Mrima hill, unless the disease causing pathogens are introduced. There is need for further studies to establish the effect of radiation on reproductive capacity and survival of disease vectors in the present study area.

**RADIATION EXPOSURE LEVELS ASSOCIATED WITH CONSTRUCTION SAND FROM THARAKA-NITHI COUNTY IN KENYA**

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**Department: Physics**

**Supervisors: Dr. Nadir Hashim**

**Dr. Sarroney Merenga**

Natural radioactivity levels and radiation risks due to construction sand mined from Tharaka region of Tharaka-Nithi County in Kenya has been measured. The region is mostly rocky with majority of rocks being volcanic rocks and sedimentary rocks of volcanic origin; the area is occupationally characterized by sand mining for construction purposes within the County and also in some parts of the neighbouring Meru and Embu Counties. The sand is mined along the river banks and also gullies that carry sand from withered rocks within the county. High concentrations of 238U, 232Th and 235U are associated with soils that are developed from acidic magmatic rocks (igneous rocks). The goal of this study was to analyze the level of
radiation exposure associated with construction sand from Tharaka region. The activity concentration levels of natural radionuclide (uranium, thorium and potassium) in the sand samples were analyzed using NaI(Tl) gamma ray spectrometer. The associated radiological parameters (radium equivalent activity, dose rates, external hazard and internal hazard indices) were calculated based on the activity obtained. The results of the naturally occurring radionuclide were as follows; 40K ranged from 32 ± 2 to 2662 ± 122 Bqkg⁻¹ with a mean value of 1069 ± 46 Bqkg⁻¹, 238U ranged from 19 ± 1 to 269 ± 13 Bqkg⁻¹ with a mean value of 98 ± 4 Bqkg⁻¹, 232Th ranged from 11 ± 1 to 114 ± 7 Bqkg⁻¹ with a mean value of 53 ± 3 Bqkg⁻¹. The mean values of activity concentration exceeded the world averages of 400 Bq/kg, 33 Bq/kg, 45 Bq/kg for K-40, U-238 and Th-232 respectively. Sand mined in Tharaka South from the gullies originating from Kijege hills and Ntugi hills were found to have elevated activity concentration especially uranium and thorium while that from Tharaka North was found to have high levels of potassium and low levels of thorium and uranium. Generally most of the samples contained elevated values of activity concentration of potassium. The hazard indices were computed and used to determine the suitability of the sand for building in the context of radiological hazard posed. Radium equivalent activity varied from 50 ± 3 to 461 ± 20 Bqkg⁻¹ with a mean value of 256 ± 13 Bqkg⁻¹, only four samples exceeded the recommended limit of 370 Bq/kg. External and Internal indices varied from 0.14 ± 0.01 to 1.23 ± 0.05 with a mean value of 0.69 ± 0.04 and 0.19 ± 0.02 to 1.80 ± 0.06 with a mean value of 0.95 ± 0.05 respectively. The outdoor absorbed dose rate calculated ranged from 22.79 ± 1.39 nG/h to 221.57 ± 9.52 nG/h with a mean of 120.99 ± 6.07 nG/h while indoor absorbed dose rate ranged from 31.15 ± 1.88 nG/h to 308.77 ± 13.20 nG/h with a mean of 166.67 ± 8.31 nG/h, the mean values were above the world averages of 54 nG/h and 84 nG/h respectively. The mean annual effective dose rate indoor and outdoor annual effective dose was 0.61 ± 0.06 mSv and 0.30 ± 0.02 mSv which was slightly above the world averages of 0.41 and 0.07 respectively but below the maximum dose constraint of 1 mSv/y to the public set by ICRP, 2005. Construction sand from the region can therefore be used without posing any danger to the public.
QUANTIFICATION OF SELECTED ESSENTIAL AND TOXIC MINERALS IN GEOPHAGIC MATERIALS IN KIAMBU COUNTY, KENYA

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Department: Chemistry.
Supervisors: Prof. Hudson Nyambaka
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Pica is described as the craving and subsequent consumption of non-food substances including earth, charcoal and uncooked rice. Various hypothesis have been fronted to explain pica among them hunger, micronutrient deficiency and protection. Geophagy, a special type of pica applicable to the deliberate consumption of soil and clay deposits cuts across socio-economic, ethnic, religious and racial divides due to cultural, medicinal, physiological and nutritional factors. In sub-Saharan Africa, its popularity has been increasing overtime especially among pregnant women and children under the age of five. Kenya has the highest prevalence rate (89.8%) of the geophagic practice as compared to other African countries. In Kiambu County, an upward trend has been exhibited in the sales made from geophagic materials. With the increase in the geophagic practice in Kiambu County, it is necessary to investigate potential benefits and/or dangers of the materials consumed with respect to their essential and toxic minerals level. The study aimed at examining the levels of essential minerals (Ca, Mg, Fe, Mn and Zn) and toxic minerals (Al, Si and Pb) in geophagic materials from Kiambu County. They were purposively sampled from eight quarry mines, four brands in supermarkets, and yellow and white colours in open-air markets and analyzed using Atomic Absorption Spectroscopy (AAS). The data was analyzed using Analysis of Variance (ANOVA) and t-test. The range was found to be ND - 27.9±0.02 (Ca), ND - 0.18±0.00 (Mg), 0.42±0.00 - 4.83±0.02 (Fe), ND - 0.23±0.03 (Mn) 64.6±0.35 - 233.0±0.89 (Al) and 184.1±0.14 – 291.8±0.34 mg/g (Si). The concentration of Zn and Pb was 10.89±0.32 - 161.67±0.03 and 1.09±0.02 - 79.67±0.04 ppm respectively. Most of the minerals varied significantly (α=0.05) and could be due to differences in their origin. Comparing essential minerals level to Recommended Daily Intakes (RDI) while assuming a 50.0% bioavailability indicated that the minerals were not present in appreciable amounts and therefore have negligible contribution (except for Fe in all the three sources and Mn in some of the sources). For toxic minerals, Al obtained from the three sources was below World Health Organization (WHO) and European Food Safety Authority (EFSA) limits. However, Si and Pb levels were found to be above the WHO/EFSA which has the potential of endangering the health of the individual. With an exception of Fe and Mn, findings point to fears of toxicity. Therefore, there is need to discourage the practice as geophagic individuals expose themselves to health risks associated with toxicity.
Helminthiasis is one of the most important diseases worldwide that cause heavy production losses in livestock. The disease is prevalent all over the world especially in developing countries and associated with poor management practices, lack of access to conventional anthelmintic drugs as a control or curative strategy and also greatly hampered by drug resistance exhibited by parasites. Farmers therefore resort to traditional medicinal plants for helminthiases treatment which lack information on their effectiveness, toxicity levels, dosages and safety. The current study aimed to determine anthelmintic effectiveness of six selected medicinal plants used in the traditional management and treatment of sheep helminthiases in Koibatek and Mogotio sub counties, Baringo County, Kenya. Field work was conducted in nine administrative units of Koibatek and Mogotio sub-counties. Demographic information on age and sex of informants was collected to check the existing knowledge and attitude on the use of medicinal plants. Further, field work was conducted to assess the prevalence of helminths in the two sub counties. Anthelmintic activities of six selected medicinal plants were tested at KALRO - Muguga North Laboratories in-vitro system using eggs and larvae of *Haemonchus contortus*. Five concentrations (6.25 mg/ul, 12.5 mg/ul, 25 mg/ul, 50 mg/ul and 100 mg/ul) of methanolic extract were tested, which involved determination of egg hatching and larval development. Levamisole (10mg/ml) was included as positive control and distilled water as negative control. The results indicated that out of 130 respondents interviewed, 49 out of 83 men and 23 out of 47 female had knowledge on the use of medicinal plants but there was no significant association in the knowledge of medicinal plant with the gender ($X^2=63.33$, d.f.=48; $P=0.068$). Methanolic and water extracts from the six medicinal plants under investigation, showed biological activities in egg hatching and larval development in varying concentrations as compared to positive and negative controls. The findings indicated a significant difference in mean of eggs hatched ($F = 65.31; P = 0.0001$) in varying methanolic concentrations with the lowest concentration being significantly different from negative controls. *Olea capensis* displayed the least mean of eggs hatched (mean 1.00±1.00 larvae); followed by *Leucas calostachys* (mean 5.67±2.31 larvae). *Jasminum floribundum* had the highest mean of eggs hatched (mean 25.33±3.51) followed by *Vepris simplicifolia* (mean 24.33±2.52) and *Olinia rochetiana* (mean 22.00±1.73) at concentration of 50 mg/ul. In larval development, there was no significant difference (F=2.613; $P=0.080$) in the mean number of larvae killed by the various methanolic plant extracts at 100 mg/ul. Plant extract from *O. capensis* had the highest number of dead larvae (mean of 9.33±0.577 larvae) followed by extracts from *V. simplicifolia* (mean of 9.0±1.0 larvae) and *O. rochetiana* (9.0±1.0). *A. aethiopicum* had the least mean larvae killed (7.0±1.0). Prevalence of helminthes was higher in the year 2006 (mean 28.13±1.73 animals) than all the years under consideration (2006-2012). Lowest prevalence rate was recorded in 2012 with a mean of
19.70±1.50 animals infested with worms. Sheep had the highest percentage of infestation with helminths (mean 27.31±1.34) followed by goats (24.01±1.59) and least was cattle with mean of 18.21±1.54 animals. There was significant difference (F=9.55; P=0.001) in helminth infestation among livestock. The findings of this study provide evidence on the potential use of medicinal plants for anthelmintic drug development from the plants in the study area. It is recommended that livestock farmers use the six medicinal plants to manage and treat sheep helminthiases and drug development Bioactive substances from these plants should be identified.
A STUDY OF THE SUBJECT OF NATIONAL HEALING AND RECONCILIATION IN SELECTED PLAYS AT THE KENYA NATIONAL DRAMA FESTIVAL 2008-2010

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Utilizing Kenya Schools and Colleges’ Drama Festival theatre space, this study investigates the use of theatre as a strategy for healing and reconciliation in the aftermath of conflict. On the assumption that plays performed at the festival are mimetic of real life, this study purposively sampled four plays performed between 2008 and 2010 in relation to calls for healing and reconciliation following Kenya’s 2007/2008 post-election violence. The performance-texts are Messiah (2008) by Joseph Murungu, The Broken Pot (2010) by Wenceslaus Masinde, Forty Minutes (2008) by Nelson Ashitiva and Barabbas (2009) by Ondiech Malala. The use of qualitative research design enabled an in-depth understanding of the performance-texts which were segmented and analyzed in terms of: the narrative content, actors/actresses performance and productions techniques. This study is founded on two theories: one, aspects of theatre performance theory as propounded, largely, by Richard Schechner and, secondly, J.L Austin’s speech act theory. Common to these two theories is the concept of performativity. While the former provided a schema for segmenting the performance-texts for purposes of analysis, the latter’s notion that utterances perform actions was instrumental in evaluating stage dialogue about healing and reconciliation. Performance analysis applied to texts selected in this study returned a result that the performers stirred critical consciousness among the spectators through their manipulation of voice, body and environmental factors. Through the narrative content, these performance-texts engage the spectators in the process of healing and reconciliation by identifying the ills and their sources, and by offering prescriptions which restore healthy relations. In the whole range of renewal of the individual and the collective are issues such as: memory, truth, acknowledgement, reparation, transitional justice, expiation, forgiveness, healing and reconciliation. This study foregrounds a persuasion that Kenya Schools and Colleges’ Drama Festival provides a platform through which, among other social issues, endeavours of national
healing and reconciliation were augmented after Kenya’s 2007/2008 post-election violence. This study recommends a theatre for reconciliation that combines the mimetic and transformational functions. For practitioners, scholars and in service for mankind, this study adds to the knowledge base at the confluence between theatre and conflict management.

CINEMATOGRAPHIC TECHNIQUES OF HILARY NGWENO’S THE MAKING OF A NATION

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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.