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Genetic Diversity and Fingerprinting of *Garcinia indica*

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Abstract:
Genomic DNA of 19 samples from Garcinia indica was isolated. The average number of alleles across all microsatellite loci stood at 18, whereas, the number of different alleles across microsatellite loci ranged between 6 and 16 with an average of 11.727. (Table1). The microsatellite marker loci ITBTGI19 and ITBTGI21 recorded highest number of different alleles (16). The overall mean of I was 2.296, The grand mean of expected heterozygosity (He) was 0.877. (Table1). Among all the loci. The mean heterozygosity values across all loci ranged between 0.756 (ITBTGI9) to 0.956 (ITBTGI19). The pair-wise genetic distance among the accessions of G. indica, the values ranged from a minimum of 56 to a maximum of 88 between different accessions the accession GI_MDG_4 recorded genetic distance of 88 with most of the other accessions Table2. The microsatellite ITBTGI1 recorded maximum allelic size of 1000 for the accession GI-KAN 3 (Table3).

Keywords: Garcinia indica, Genetic diversity, DNA, Marker

INTRODUCTION

Genus *Garcinia*, a largest member of the family Clusiaceae (Guttiferae), which comprises more than 250 species, are widely distributed across the tropical world, among them, 35 species are found in India, of which six are endemic to the evergreen forests of *Western Ghats* (Peter and Abraham, 2007). The genus *Garcinia* is native to the South East Asia. In India, *Garcinia* species propagate widely in a semi-wild state, in Maharashtra 'Konkan' area, Goa, coastal areas of Karnataka and Kerala, Assam evergreen forests, Khasi, Jantia hills, West Bengal and Gujarat.

Garcinia species are evergreen trees and shrubs which thrive well in high rainfall areas of the tropics. The trees are dioecious and hence are cross-pollinated. The fruits of *Garcinia* species show the anti-obesity property because of presence of the compound called (-)-Hydroxycitric acid (HCA), which made these species popular in the international market. The most popular species of the genus *Garcinia* is *G. mangostana*, which is commonly known as mangosteen and has been named as 'queen of tropical fruits' for its unique pleasant taste and visual appearance of a crown-like structure (Chinavat and Subadrabuddhe, 2004). The seeds and pericarps of the fruit have a long history of use in the traditional medicinal practices of the region, and beverages containing mangosteen pulp and pericarps are sold worldwide as nutritional supplements. The fruits of *Garcinia* species have an anti-obesity compound called (-)-Hydroxycitric acid (HCA), which made

these species popular in the international market. Other phytochemicals present in the species are isoprenylated xanthones, a class of secondary metabolites with multiple reports of biological effects, such as antioxidant, pro-apoptotic, anti-proliferative, antinociceptive, anti-inflammatory, neuroprotective, hypoglycemic and anti-obesity.

The center of diversity of Garcinia species is the Malaysian region, with some species reaching India and the Micronesian islands and also extending to tropical Africa and the Neotropics (Rogers and Sweeney 2007; Stevens, 2007; Jones, 1980; Sharma et *al.*, 2013; Nimanthika and Kaththriarchi, 2010). Genetic diversity of a particular species at different levels are analyzed by various methods which include; morphological characterization of the individuals in different populations of the species, biochemical analysis using allozymes and use of molecular markers. Among these methods, using molecular markers such as DNA markers is considered an efficient way to assess genetic diversity (Mondini *et al.,* 2009). Molecular markers overcome the limitations of morphological characterization by being stable and unaffected by environment and that of, biochemical analysis by being abundant in the majority of the species. Thus, using the suitable molecular DNA based markers for studying genetic diversity gives us a better understanding of the organism, its genetic makeup and its diversity at different levels of the ecosystem. Simple Sequence Repeats (SSR) or microsatellite markers are a short stretch of nucleotides as sets of two to six base-pairs repeating sequences which are grouped as DNA markers found within the eukaryotic genome. SSR markers are widely used in animal and plant species for their advantages in being co-dominant, showing high allelic diversity and abundance. Their high reproducibility and ease of accessing the SSR size variation through PCR amplification along with flanking primers make them popular genetic markers to be used in diversity studies (Qosim *et al*., 2011).

MATERIAL AND METHOD

Genomic DNA of 19 samples from *Garcinia indica* was isolated. The protocol for genomic DNA isolation given by Doyle and Doyle (1987) was followed up with a few modifications.

Procedure

1. About 1 g of fresh leaf tissue from each sample was chopped and mixed with 1 ml of CTAB extraction buffer in 2 ml centrifuge tubes. Samples were crushed using Tissuelyser –II (Qiagen). Frequency used was 25/sec for 10 minutes.
2. The samples were kept in water bath for 30- 45 minutes at 65˚C.
3. The incubated samples were centrifuged at 10,000 rpm for 10 minutes at room temperature.
4. The supernatants were transferred in to fresh tubes after discarding the leaf debris. 500 µl of Chloroform-Isoamyl alcohol (24: 1) was added to each sample and then centrifuged at 10,000 rpm for 10 minutes at room temperature.
5. The above step was repeated once or twice until a clear bilayer of supernatant and debris was obtained.
6. The supernatants were collected in fresh tubes. For 500 µl of supernatant 300 µl of chilled isopropanol was added and mixed well and stored at -20° C for overnight.
7. The samples were centrifuged for 10 minutes at 10000 rpm to obtain a pellet containing genomic DNA.
8. The supernatant was drained from the tubes and pellets were washed by centrifuging with 500 µl of 70 per cent ethanol at 10000 rpm for 10 minutes.

9. The pellets were dried at room temperature for complete evaporation of ethanol. About 40 µl of TE buffer (Tris HCl: EDTA in 10: 1) was added to each DNA sample for dilution of DNA.

PCR Amplification of DNA Samples Using SSR Markers

PCR amplification of genomic DNA of *Garcinia indica* was carried out using SSR primer pairs synthesized at CBR, Department of Biotechnology and Crop Improvement, College of Horticulture, Bengaluru

Separation of Microsatellite Markers

Separation and visualization of PCR products was done on agarose (2.5 per cent). Agarose was casted in 2.5 per cent gels in TAE buffer (1X). Slabs gels were casted in a horizontal gel frame (Hoefer HE99X 18 x 30 cm, Amersham Bioscience Pvt. Ltd. USA). Products were visualized by incorporating 1 µl (10 mg/ml) of Ethidium Bromide (ETBR) per 10 ml of gel solution and viewed in a gel documentation system (Syngene Pvt. Ltd.

Statistical Analysis

The gel pictures were scored for allele size using Gen Alexs 6.5 software algorithm. Genetic diversity parameters, *viz*., number of alleles (Na), number of effective alleles (Ne), gene diversity (He), observed heterozygosity (Ho), major allele frequency (MAF), polymorphic information content (PIC), Wright's inbreeding coefficient (F), and Shannon's information index (I), were estimated for the 25 SSR markers in *Garcinia indica* samples. Wherein, "Ho" is the actual amount of heterozygosity measured at a particular locus or population, and "He" is the proportion of heterozygosity expected for a particular locus or population undergoing random mating and acting within Hardy-Weinberg equilibrium. The decline in heterozygosity due to subdivision within a population was quantified using an index known as Wright's "F"-statistics (F) (Wright 1965). "PIC" and "I" are the marker in formativeness and discriminating power of the markers based on the allelic frequency of each locus. Statistical analysis was performed using the software packages GenAlex 6.5 (Peakall and Smouse 2012) and Power Marker 3.25 (Liu and Muse 2005). Locus wise F-statistics (F_{st}, F_{is}, and F_{it}) and level of gene flow ($Nm = (1/F_{st})-1)/4$) were estimated for the subpopulations to find out the efficiency of 25 DNA markers in genetic discrimination of using the soft- ware package Popgene (Yeh *et al.*, 1999).

RESULT

Polymorphism and Allelic Frequency

The polymorphism and allelic frequency of *G. indica* selected 19 accessions was assessed using a set of 22 microsatellite markers. The average number of alleles across all microsatellite loci stood at 18, whereas, the number of different alleles across microsatellite loci ranged between 6 and 16 with an average of 11.727 across the selected accessions of *G. indica*. The microsatellite marker loci ITBTGI19 and ITBTGI21 recorded highest number of different alleles (16) followed by marker loci ITBTGI5, ITBTGI7, ITBTGI15, ITBTGI16 and ITBTGI22 with 14 alleles and loci ITBTGI9and ITBTGI11recorded least number of different alleles (6). Number of effective numbers of alleles (Ne) recorded on an average of 9.116 across all the loci and maximum for the marker loci ITBTGI19 (14.440) followed by ITBTGI21 (13.370) and the marker loci ITBTGI9 recorded the minimum value of 3.767. Shannon's Information Index (I) was considered as a parameter for genetic variation among the microsatellite loci. The overall mean of I was 2.296. Among all the loci the grand mean of observed heterozygosity (Ho) was 0. The grand mean of expected heterozygosity (He) was 0.877. The mean heterozygosity values across all loci ranged between 0.756 (ITBTGI9) to 0.956

(ITBTGI19). The allelic frequencies of microsatellite loci and their grand mean is presented in Table 1.

The pair-wise genetic distance among the accessions of *G. indica*, the values ranged from a minimum of 56 to a maximum of 88 between different accessions. The genetic distance of 88 was exhibited among many *G. indica* accessions.

The accession GI_MDG_4 recorded genetic distance of 88 with most of the other accessions, while the least genetic distance of 56 was exhibited between GI_KOK_1 and GI_KAR_15. The pair-wise genetic distance for all the accessions of *G. indica* are presented in Table2. The allele frequencies across loci were assessed with Graph over Loci for Codominant Data for *G. indica* accessions, where two markers- ITBTGI8 and ITBTGI10 showed higher allelic frequencies followed by markers ITBTGI2 and ITBTGI1 and the markers with low allelic frequency were; ITBTGI4, ITBTGI18 and ITBTGI20 among the 22 markers across loci. The Graph over Loci for Codominant Data for *G. indica* accessions is presented in Figure.1.

Principal Coordinate Analysis

The Principal Coordinate Analysis (PCA) was carried out to understand the relationships between the sampled accessions of *G. indica* based on genetic distance and is represented in Figure.2.

Both upper and lower quadrants on the right represented *G. indica* accessions sampled from Uttara Kannada and Dakshina Kannada whereas, the left upper quadrant consisted of one accession sampled from Udupi along with Uttara Kannada and Dakshina Kannada and the lower left quadrant represented the one accession sampled from Chikmagalur along with Uttara Kannada and Dakshina Kannada.

Phylogenetic Analysis

The Neighbour Joining (NJ) phylogenetic tree constructed across 19 accessions of *G. indica* (Figure 3) in the present study revealed the existence of two major clusters - Cluster 1 and Cluster 2. The cluster 1 was further sub-divided into two sub-clusters (C1a and C1b).

Sub-cluster C1a consisted of accessions sampled from Uttara Kannada and Dakshina Kannada regions, whereas the sub-cluster C1b consisted of accessions sampled from Udupi, Uttara Kannada and Dakshina Kannada. On the other hand, the sub-cluster C2 consisted of accessions from Chikmagalur along with accessions from Uttara Kannada and Dakshina Kannada.

DNA Fingerprinting of *Garcinia indica* Accession

A set of twelve polymorphic microsatellite markers with reproducible amplification pattern were scored for DNA fingerprinting of 19 selected *G. indica* accessions.

The microsatellite ITBTGI1 recorded maximum allelic size of 1000 for the accession GI-KAN 3, whereas, the microsatellite marker ITBTGI12 exhibited least allelic size of 107 specific to the accession GI-KAN20. Three different microsatellites; ITBTGI4, ITBTGI16 and ITBTGI20 recorded different allelic sizes of 218, 184 and 220, respectively, for the accession GI-SIR 5. The allelic sizes of the PCR amplified products using these microsatellite markers for all accessions is presented in (Table.3).

Table 1: Heterozygosity, F statistics and polymorphism of *G. indica* by locus for codominant data

	N	Na	Ne	I	Ho	He	UHe	F
ITBTGI1	19	9	5.730	1.937	0.000	0.825	0.848	1.000
ITBTGI2	18	10	6.231	2.058	0.000	0.840	0.863	1.000
ITBTGI3	16	10	8.000	2.187	0.000	0.875	0.903	1.000
ITBTGI4	19	13	8.395	2.361	0.000	0.881	0.905	1.000
ITBTGI5	18	14	11.571	2.553	0.000	0.914	0.940	1.000
ITBTGI6	18	12	9.000	2.351	0.000	0.889	0.914	1.000
ITBTGI7	18	14	11.571	2.553	0.000	0.914	0.940	1.000
ITBTGI8	17	11	8.257	2.262	0.000	0.879	0.906	1.000
ITBTGI9	18	6	3.767	1.503	0.000	0.735	0.756	1.000
ITBTGI10	17	10	8.758	2.232	0.000	0.886	0.913	1.000
ITBTGI11	18	6	4.050	1.565	0.000	0.753	0.775	1.000
ITBTGI12	18	10	8.526	2.216	0.000	0.883	0.908	1.000
ITBTGI13	15	10	7.759	2.176	0.000	0.871	0.901	1.000
ITBTGI14	18	11	8.526	2.274	0.000	0.883	0.908	1.000
ITBTGI15	19	14	11.645	2.552	0.000	0.914	0.939	1.000
ITBTGI16	19	14	10.314	2.507	0.000	0.903	0.927	1.000
ITBTGI17	19	13	10.939	2.479	0.000	0.909	0.933	1.000
ITBTGI18	17	13	9.323	2.425	0.000	0.893	0.920	1.000
ITBTGI19	19	16	14.440	2.726	0.000	0.931	0.956	1.000
ITBTGI20	19	12	8.805	2.333	0.000	0.886	0.910	1.000
ITBTGI21	19	16	13.370	2.698	0.000	0.925	0.950	1.000
ITBTGI22	18	14	11.571	2.553	0.000	0.914	0.940	1.000
Mean	**18**	**11.72**	**9.116**	**2.296**	**0.000**	**0.877**	**0.902**	**1.000**
S.Em±	0.22	0.58	0.57	0.06	0.00	0.01	0.01	0.00

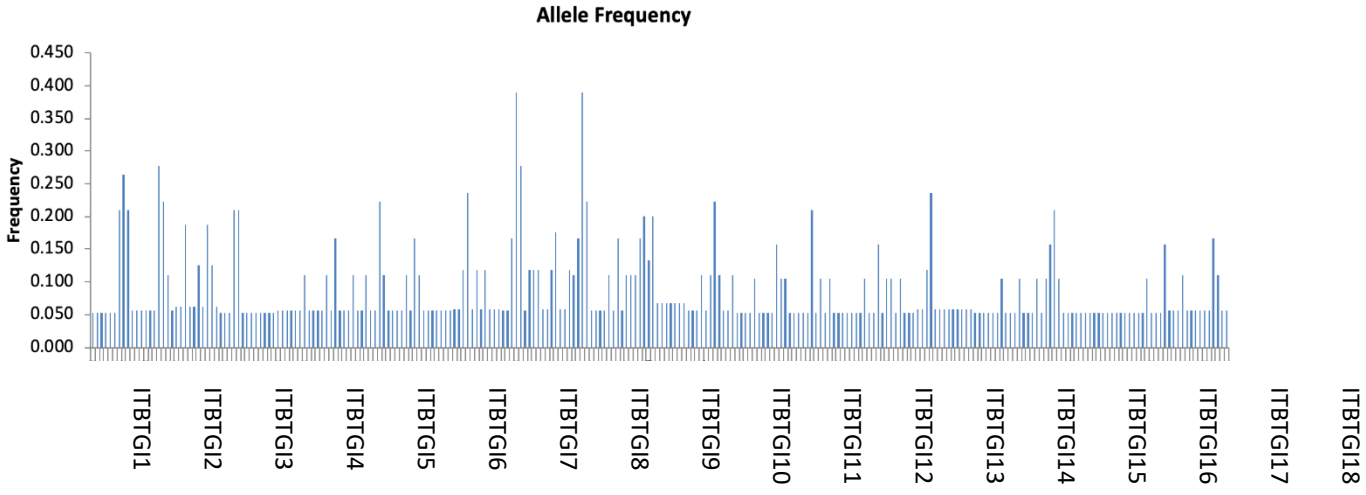

Figure 1: Allele Frequencies of *G. indica* by population with graph over loci for codominant data

Table 2: Euclidean distance of each genotype based on cluster analysis in *G. indica*

	GI_KAR_5	GI_KAR_9	GI_KAAZAR_10	GI_KAR_14	GI_KAN_13	GI_KAN_3	GI_KAN_4	GI_KAN_5	GI_KAN_6	GI_KAN_7	GI_KAN_20	GI_SIR_5	GI_KAR_15	GI_KOK_1	GI_KAN_12	GI_KAN_15	GI_SID_1	GI_PUT_1	GI_MDG_4
GI_KAR_5	0																		
GI_KAR_9	80	0																	
GI_KAR_10	76	60	0																
GI_KAR_14	76	72	76	0															
GI_KAN_13	80	80	80	84	0														
GI_KAN_3	84	88	68	84	80	0													
GI_KAN_4	80	88	84	80	76	64	0												
GI_KAN_5	88	84	84	84	84	68	72	0											
GI_KAN_6	76	84	84	84	80	88	80	84	0										
GI_KAN_7	80	80	88	80	80	84	76	80	80	0									
GI_KAN_20	84	84	88	88	88	88	84	84	76	72	0								
GI_SIR_5	80	80	84	84	88	80	84	80	84	80	76	0							
GI_KAR_15	88	84	84	84	72	84	84	80	88	80	88	72	0						
GI_KOK_1	88	84	84	88	80	80	84	80	88	84	88	84	56	0					
GI_KAN_12	84	80	88	80	84	88	80	88	80	84	84	84	84	72	0				
GI_KAN_15	88	76	84	80	84	80	88	84	84	88	80	88	80	72	64	0			
GI_SID_1	84	88	84	80	76	76	88	84	84	88	88	84	76	84	84	76	0		
GI_PUT_1	84	88	88	84	76	88	88	88	80	88	84	88	76	88	84	84	64	0	
GI_MDG_4	84	88	88	88	84	88	84	88	84	88	84	88	88	88	88	88	84	68	0

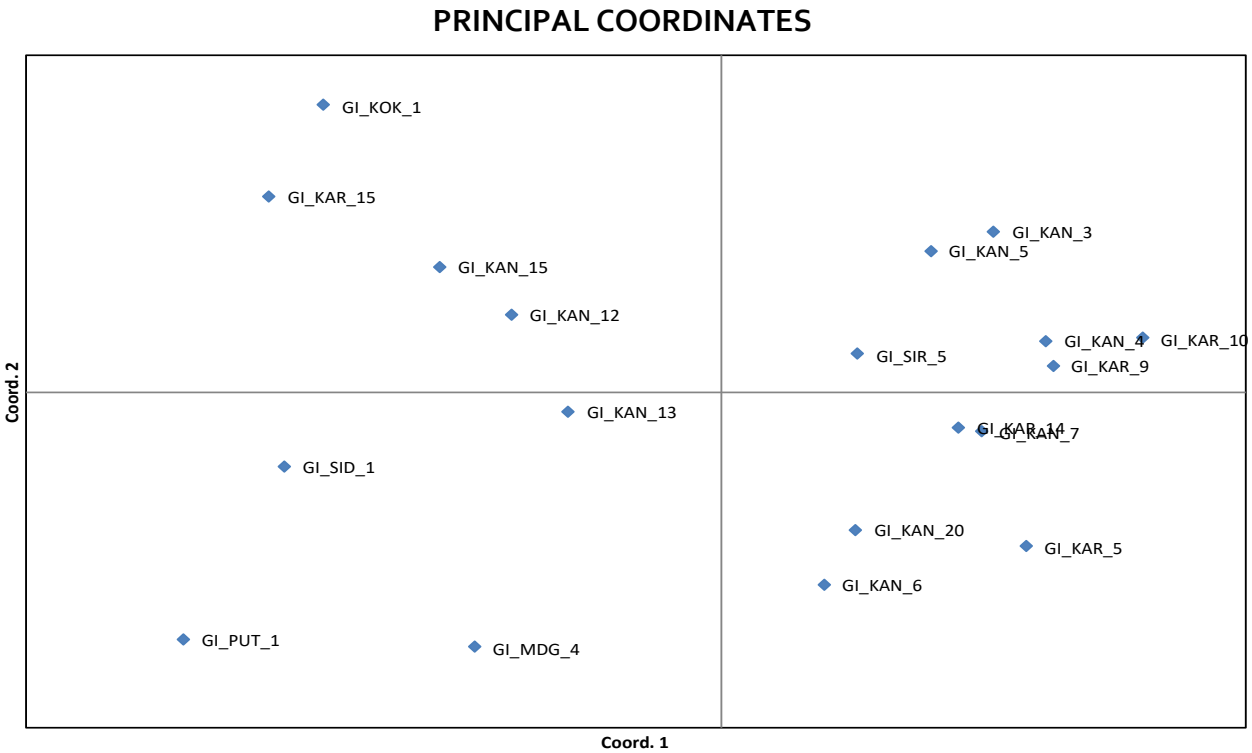

Figure 2: Principle coordinates analysis (PCA) using pair-wise genetic distance matrix of 19 G. indica accessio

Table 3: DNA Fingerprints for selected *G. indica* accessions

Sl. No.	Accession	Fingerprints		
1	GI- KAR 5	(ITBTGI26) $_{256}$		
2	G.I- KAR 9	(ITBTGI8) $_{409}$		
3	G.I- KAR 10	(ITBTGI8) $_{414}$		
4	G.I- KAR 14	(ITBTGI8) $_{392}$		
5	G.I- KAN 13	(ITBTGI8) $_{414}$		
6	G.I- KAN 3	(ITBTGI1) $_{1000}$		
7	G.I- KAN 4	(ITBTGI18) $_{211}$		
8	G.I- KAN 5	(ITBTGI16) $_{144}$		
9	G.I- KAN 6	(ITBTGI18) $_{144}$		
10	G.I- KAN 7	(ITBTGI18) $_{146}$		
11	G.I- KAN20	(ITBTGI12) $_{107}$		
12	G.I- SIR 5	(ITBTGI4) $_{218}$	(ITBTGI16) $_{184}$	(ITBTGI20) $_{220}$
13	G.I- KAR 15	(ITBTGI16) $_{165}$		
14	G.I- KOK 1	(ITBTGI16) $_{161}$	(ITBTGI16) $_{161}$	(ITBTGI20) $_{195}$
15	G.I- KAN 12	(ITBTGI18) $_{193}$	(ITBTG I20) $_{227}$	
16	G.I- KAN 15	(ITBTGI7) $_{219}$		
17	G.I- SID 1	(ITBTGI6) $_{300}$		
18	G.I- PUT 1	(ITBTGI22) $_{319}$		
19	G.I- MDG 4	(ITBTGI19) $_{204}$		

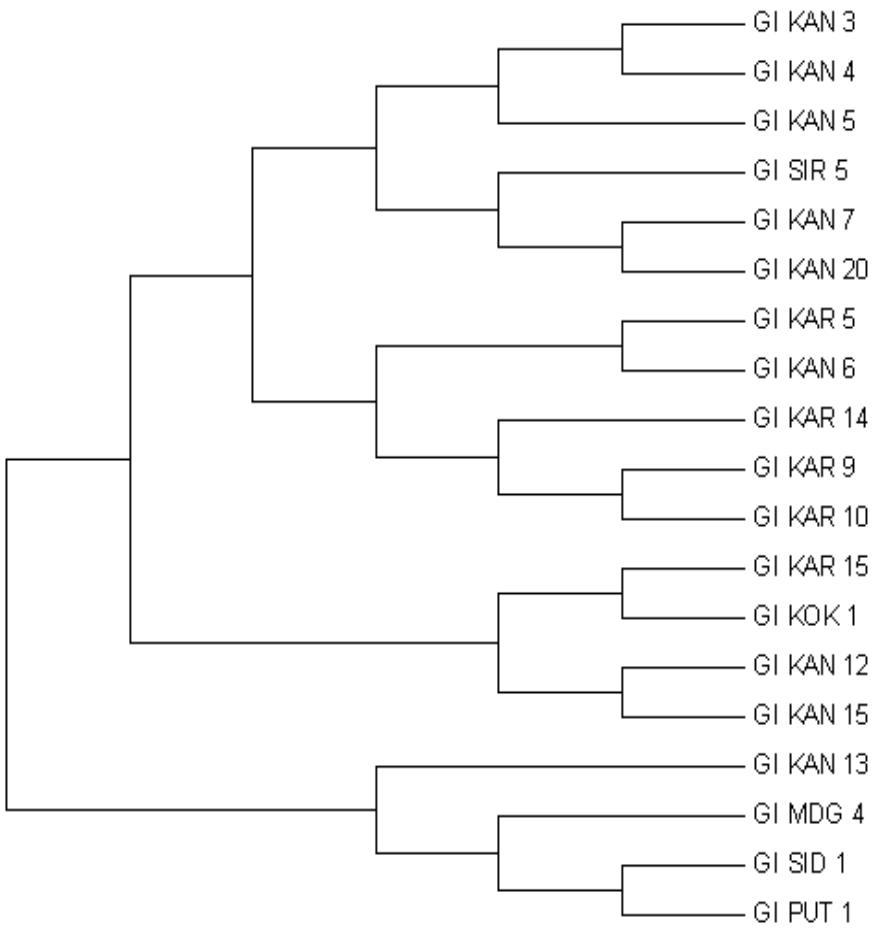

Figure.3: Neighbor Joining (NJ) tree constructed using MEGA V5 based on pair-wise genetic distance across *G. indica* accessions

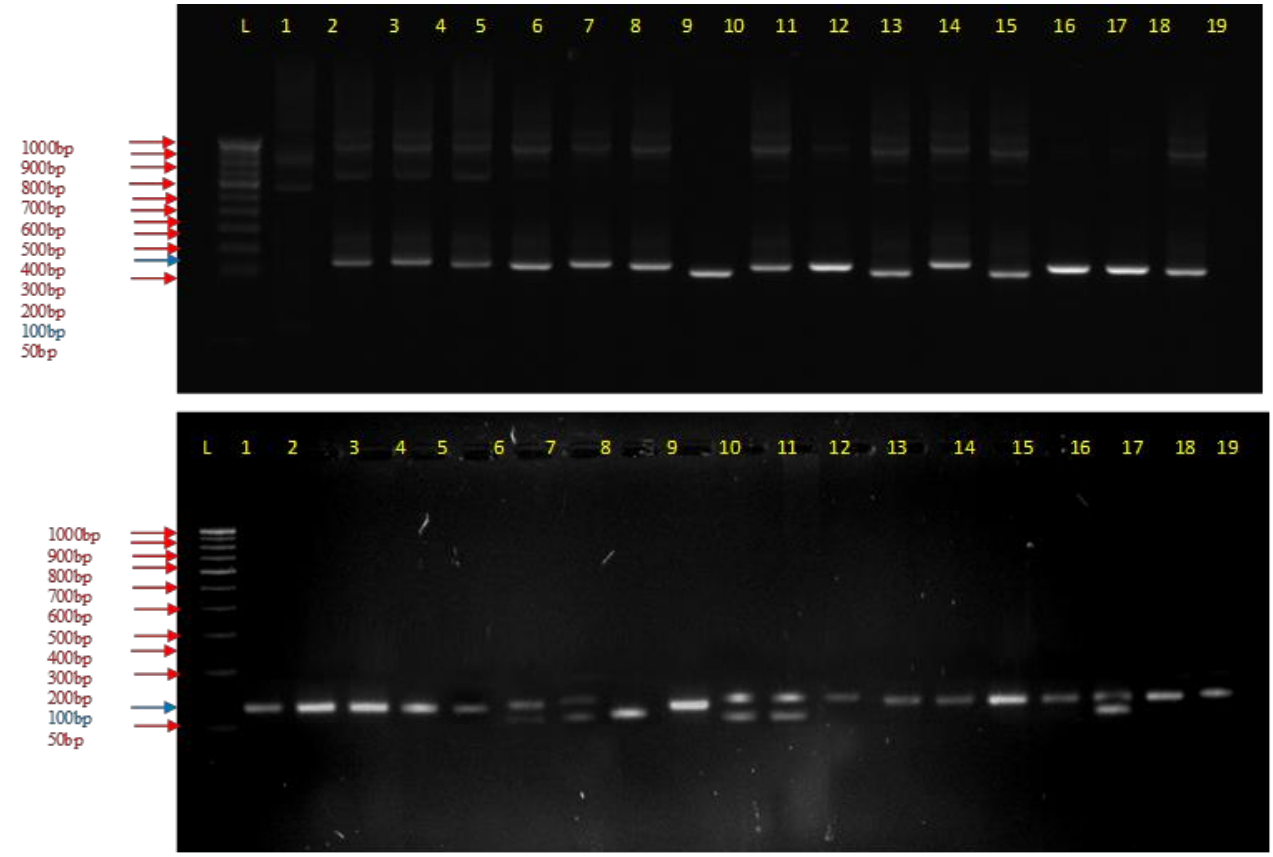

Plate 4: 8.PCR profile *G. indica* accessions using SSR marker. The number1 to 19 represent *G. indica* accessions and L represents ladder (100bp)

DISCUSSION

The genetic diversity of *Garcinia* species can be assessed by efficient techniques involving biochemical and molecular approaches. Among them, molecular markers have proven to be an efficient tool for elucidating genetic diversity present in the species. Several works of genetic diversity analysis in *Garcinia* species have used various molecular markers such as RAPD (Tharachand, 2015), ISSR (Mansyah *et al.*, 2010), AFLP (Sobir *et al.*, 2009), SSR (Qosim *et al.*, 2011), *etc*. which were efficient in various aspects of genetic diversity analysis as evidenced by the results of respective studies. Simple Sequence Repeats (SSR) or microsatellites are efficient genetic markers that are popular because of their co-dominant inheritance, high abundance, the enormous extent of allelic diversity, ease of assessing SSR allele size variation through PCR and high reproducibility (Mondini *et al.*, 2009). In the present, study SSR markers were used and results are discussed in the following sections.

Polymorphism and allelic frequency of *G. indica* accessions were assessed using 22 microsatellite markers. The average number of alleles across all microsatellite loci stood at 18, whereas the number of different alleles across microsatellite loci ranged between 6 and 16 with an average of 11. 272 across the accessions of *G. indica*. The loci GI_M19 and GI_21 recorded the highest number of different alleles (16) followed by loci GI_M5, GI_M7, GI_15, GI_16 and GI_22 with 14 alleles and loci GI_M9 and GI_M11 recorded the least number of different alleles (6). The number of Effective numbers of alleles (Ne) recorded an average of 9.116 across all the loci and maximum for the loci GI_M19 (14.440) followed by GI_M21 (13.370) and the loci GI_M9 recorded the minimal value of 3.767.

Shannon's Information Index (I) was considered as a parameter for genetic variation among the microsatellite loci. The overall mean of I was 2.296. Among all the loci the grand mean of observed heterozygosity (H0) was 0. The grand mean of expected heterozygosity (He) was 0.877. The mean heterozygosity values across all loci ranged between 0.756 (GI_M9) to 0.956 (GI_M19). The allelic frequencies of microsatellite loci and their grand mean are comparable to previous reports by Roy *et al*. (2015) and Ravishankar *et al.* (2015) in *G. indica*. The pair-wise genetic distance among the accessions of *G. indica* ranged from 56 to 88 between different accessions. The genetic distance of 88 was exhibited among many *G. indica* accessions. The accession GI_MDG_4 showed significant genetic distance of 88 with most of the other accessions, while the least genetic distance of 56 was exhibited between GI_KOK_1 and GI_KAR_15 among all the accessions. The allele frequencies across loci were assessed with Graph over Loci for Codominant Data, where two markers- ITBTGI8 and ITBTGI10 showed higher allelic frequencies followed by markers ITBTGI2 and ITBTGI1. ITBTGI4, ITBTGI18 and ITBTGI20 recorded low allelic frequency among the 22 markers across loci. The Graph over Loci for Codominant Data for *G. indica* accessions is presented in Figur 1. Similar results were reported by Roy *et al.* (2015) in *G. indica*

Principal Coordinate Analysis (PCA) carried out to understand the relationships between the sampled accessions of *G. indica* based on genetic distance and is represented in Figure 2. Both upper and lower quadrants on the right represented *G. indica* accessions sampled from Uttara Kannada and Dakshina Kannada whereas, the left upper quadrant consisted of one accession sampled from Udupi along with accession collected from Uttara Kannada and Dakshina Kannada. The lower left quadrant represented the one accession sampled from Chikmagalur along with accession from Uttara Kannada and Dakshina Kannada.

The PCA obtained in the present study separated the accessions as well as individuals based on their geographical distribution which is possibly due to high degree of diversity between different populations than within a particular population. Similar results were obtained for ISSR marker profiling of different *Garcinia* species the from *Western Ghats* and Northeastern Himalayas, wherein, *Garcinia* species were separated into different quadrants based on the geographical distribution (Parthasarathy *et al.,* 2013). The genetic diversity and population structure of a species are well understood by analyzing the differences in allelic frequencies and phylogenetic relationship of individuals in a population and among different populations across the different geographical regions. Phylogenetic analysis clearly distinguishes a genetically distinct individual or a population from the rest (Sivu *et al.,* 2017) and Chinavat and Subadrabuddhe (2004). In *Garcinia* species, analysis of the phylogeny of populations is an important step in understanding the relationships among the populations and their evolution.

The Neighbor--Joining (NJ) phylogenetic tree constructed across 19 accessions of *G. indica* and represented in Figure 3. In the present study, two major clusters existed *viz.,* Cluster 1 and Cluster 2. The cluster 1 was further sub-divided into two sub-clusters (C1a and C1b). Subcluster C1a consisted of accessions sampled from Uttara Kannada and Dakshina Kannada regions, whereas the sub-cluster C1b consisted of accessions sampled from Udupi, Uttara Kannada and Dakshina Kannada. On the other hand, cluster C2 consisted of accessions from Chikmagalur along with accessions from Uttara Kannada and Dakshina Kannada. This type of genetically admixured clusters obtained by Randomly Amplified Fingerprinting (RAF) of mangosteen (*Garcinia mangostana*) ecotypes collected from different regions of Australia (Sando *et al.,* 2014).

The results obtained for DNA fingerprinting analysis indicated that microsatellite ITBTGI1 recorded maximum allelic size of 1000 bp for the accession G.I-KAN 3, whereas, the microsatellite ITBTGI12 exhibited least allelic size of 107 for the accession G.I-KAN20. Three different microsatellites *viz.* ITBTGI4, ITBTGI16 and ITBTGI20 recorded different allelic sizes of 218, 184 and 220 bp respectively for the accession G.I-SIR 5. The allelic sizes of the PCR amplified products using these markers for all accessions are-presented in Table 4.3.2. A total of 25 SSRs were used to assess fingerprinting among the 19 genotypes. Out of 25 SSRs, 7 showed clear polymorphic amplification profiles. Results from the present study indicated the presence of a vast genetic diversity among the analyzed *G. indica* and *G. caombogia* accessions. Similar results were also reported by Begum *et al*., (2012) indicating the occurrence of an intense gene flow between these two varieties. DNA fingerprints obtained by hybridization of mini-satellite probes with genomic DNA was first reported by Adato *et al*. (1995). Subsequently, DNA fingerprints were developed for 59 Florida mango cultivars using capillary electrophoresis by Schnell *et al*. (2005), but such fingerprints were not based on genotype-specific allele sizes. Viruel *et al*. (2005) distinguished 28 mango genotypes with just three SSR markers. Cultivar-specific alleles of six varieties were obtained by Pandit *et al*. (2007) by using a combination of eight ISSR primers based on 2 per cent agarose gel electrophoresis.

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Conceptualizing Quality Assurance and its Application in Zimbabwe's Tertiary Education

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Abstract:
The contribution of tertiary education to a nation's scientific and technological advancement is unquestionable. Thus, its institutions drive these ambitions through research, innovation, and industrialisation. In this context, this conceptual paper sought after the application of quality assurance procedures and mechanisms in Zimbabwean tertiary education. The research methodology was grounded in a qualitative desk study approach. This involved an electronic search query of the issue under review from peer-reviewed journals and proceedings. The findings and discussion in this conceptual paper revealed that in Zimbabwe, quality education is conceptualised as creating a conducive environment that enables the delivery of the curriculum using suitable methods to allow students to acquire relevant competencies. This is the basis for the operations in tertiary education to be grounded in the ethos of the Manpower Development Acts (Chapter 28:02) and Zimbabwe Council for Higher Education (Chapter 25:27). These facilitate the creation of a system in tertiary education comprising external and internal assurance, accountability, continuous improvement, and accreditation interconnected to create a network, which enhances the system's operations. These findings provide insight into components of the quality assurance system and their role in entrenching quality culture in tertiary institutions to enhance the competitiveness of their products and services. The issue under discussion in this conceptual paper is of countless worth to issues of quality assurance in both private and public tertiary institutions.

Keywords: Assurance, conceptualizing, education, quality, tertiary

INTRODUCTION

The world over the education system has undergone fundamental reforms to meet the need for human capital [1]. In most instances, these reforms are guided by constructivism and competence-based education philosophies [2]. This is done with the view to equip the human capital in the education system not only with the existing competences but also a broad range of broad skills [3]. This was done taking into cognisant that competitiveness of human capital from a country is mostly influenced by the quality of teaching-learning in tertiary education [4]. In this context, the transformation of the tertiary education underscores the relevance for students to be equipped with competences that enables them to be functional in the real world of work [5]. This brought to the forefront the need for quality assurance to be at the core of a top-down and centralised tertiary education system [6]. Thus, its organisational and operational structures are bureaucratic and hierarchical in nature (i.e., the Ministries of Higher and Tertiary Education,

Innovation, Science, and Technology Development) that oversees all the teaching-learning in tertiary institutions through monitoring structures [7]. This operational structure was introduced to improve institutional efficiency, effectiveness, competitiveness, and sustainability [8].

In this regard, it's significant to acknowledge that Zimbabwe's tertiary education system adopted a quality assurance procedure motivated by a 'one-size-fits-all' scheme [9]. Thus, its practices provide tertiary institutions with a structured, and systematic tertiary education system targeted at improving areas, such as students' competence levels [10]. However, its application in Zimbabwe's tertiary institutions has in some instances encountered challenges [11]. Thus, its relevance and appropriateness are at times questioned [12]. In this respect, the progressive integration of quality assurance system into tertiary education has not been accompanied, to the same extent, by rigorous research [13]. Thus, there is a dearth of literature interrogating the extent to which its application has transformed the relevant components of quality culture in tertiary education. It is in this respect that this conceptual paper is geared towards contributing to this discourse by expanding knowledge from a literature perspective on the application of the quality assurance in Zimbabwe's tertiary education.

METHODOLOGY

Qualitative desktop study approach in this conceptual paper uses arguments, thoughts, and expressions as evidence, instead of mathematical facts. Hence, the key phrases - quality in tertiary education, quality assurance, quality assurance structures, and drivers of quality in tertiary education in Zimbabwe guided the search for relevant information. The relevant literature was sourced through an electronic search that was delimited to articles and reviews accredited to Google Scholar, Scopus, Scielo, DOAJ, WoS, and IBSS since they would have undergone a rigorous peer review process [14]. Studies published between 2003 and 2023 on quality assurance and their role in tertiary education in Zimbabwe were carefully chosen and reviewed in pursuit of trends and themes. Data generation and analysis occurred simultaneously and iteratively. In this conceptual paper checks for consistency and credibility were done on the sourced data [15].

FINDINGS AND DISCUSSION

Tertiary institutions commit to offering quality research, teaching, and service to their internal and external clients through involvement and continuous improvement [16]. Thus, this section focuses on the integration of quality assurance and its application in Zimbabwean tertiary education.

Quality and its Conceptualization in Tertiary Education

The tertiary education in Zimbabwe comprises universities, polytechnics, teachers' training colleges, and technical-vocational training centres that mandate to impact relevant competencies through exposing students to the 'Heritage-Based 5.0' curriculum framework [17]. Thus, operations in tertiary education grounded in teaching, research, community service, innovation, and industrialisation. It is in this regard the Government of Zimbabwe, had made some effort to advance the quality of processes in tertiary education through the enactment of legislature to superintend over their operations. Thus, the Zimbabwe Council for Higher Education (ZIMCHE) Act (Chapter 25:27) and Manpower Development Act (Chapter 28:02) were introduced to regulatory bodies for universities, and polytechnics respectively [18, 19]. These acts are expected to guide tertiary institutions in their quest towards making optimum contributions to Zimbabwe's scientific and technological advancement [20]. Hence, the quality success experience in some industrial and commercial settings necessitated the introduction of quality

assurance procedures, and strategies into the tertiary education context [21]. Thus, demand for the creation of quality culture in structures and operations of Zimbabwe's tertiary education was at the core of the nation's call for reforms.

In this regard, 'quality' has become a significant concept to all the stakeholders in tertiary education, in terms of their expectations from learning [22, 23]. This makes quality of education to be looked at through the process dimension (standards, reporting and control, students' needs, workflow, technology integration in operations, and industry integration); engagement and development dimension (motivation, critical thinking, problem-solving, interdisciplinarity, and flexible in learning designs); and content dimension (teaching and research integration, learning objectives, content quality, teaching strategies, and knowledge integration) [24]. In other words, quality education focuses on learning infrastructure and resources, technology, programme's relevance to industry, modules (content), lecturing methodology, attachments, lecturers' qualifications, and performance awards [25].

The purpose of tertiary education has always been to empower students with relevant competencies in anticipation they will be functional in a scientifically and technologically-charged society. Thus, tertiary education must ensure that what these students receive in teaching-learning activities is of expected quality. Therefore, quality in tertiary education is significant given the fact that what students learn affects their philosophy 'mindset' [26]. Therefore, quality education is considered as an entirety of features of products or services, which it them to satisfy society and students' desires [27]. In this case, quality is seen as a fortitude that enhances an institution to withstand stiff competition locally and even beyond. Therefore, the aspirations of the 'Heritage-Based Education 5.0' curriculum framework have set the tone for the need to improving the quality of education in tertiary institutions. This new thrust in education has increased demand for quality and has called for the government through the responsible ministries to mobilise substantial human, material, and financial resources to be used in learning activities. It is in this context, that quality assurance mechanisms, which encompass the interests of the organisation and the clients have been put in place in most tertiary institutions. In this regard quality in education can be looked into through multidimensional indicators (i.e., qualities of curriculum, teaching-learning, educational facilities, internal and external quality assurance procedures and graduates' competencies) that are interlinked [28]. This is dependent upon how tertiary institutions create a climate, which encourages academic excellence grounded in a system that fosters professional growth. This calls for the adoption of a holistic system that looks at the students and their learning context notwithstanding the societal reality in which the institutions operate [29]. It is against this background that the next section interrogates the quality assurance system in tertiary education are operationalised.

Quality Assurance System in Zimbabwe's Tertiary Education

In Zimbabwe, quality assurance systems are integrated into tertiary education's operations with the view to maintaining quality in learning [30]. This is done through a series of planned and systematic actions (i.e., sound management practices, measurement methods, competent human capital, etc.) targeted at boosting confidence in both the internal and external clients of tertiary institutions [31]. The primary responsibility of Zimbabwe's tertiary institutions both private and public is to provide quality service to their internal and external clients. It is against this background that these institutions through responsible ministries adopted a quality assurance system comprising procedures, criteria, and mechanisms to be adhered to during day-to-day operations [32]. This is done in tertiary education targeted at safeguarding the quality of

performance by institutions in teaching, research, community service, innovation and industrialisation [33]. Thus, institutions are monitored according to stipulated procedures and mechanisms.

Thus, these systems continuously monitor and evaluate institutions' performance in the context of set standards (i.e., what the institution does and how they do it). In this context, these quality assurance systems consist of an organised sequence of procedures (i.e., assessment, evaluation, rational decision making, planning, implementation, and reexamination to regulate anticipated alterations to the initial plan) [34]. Therefore, it can be advanced that internal and external quality assurance systems work hand-in-hand. Hence, these are viewed as creating a platform that enables institutions to operate bearing in mind the society's expectations. It's significant to acknowledge that the quality assurance in tertiary education comprises of various components, which intertwined to form an operational system [35]. Figure 1 is a representation of the interlinked components of a quality assurance system in tertiary education context.

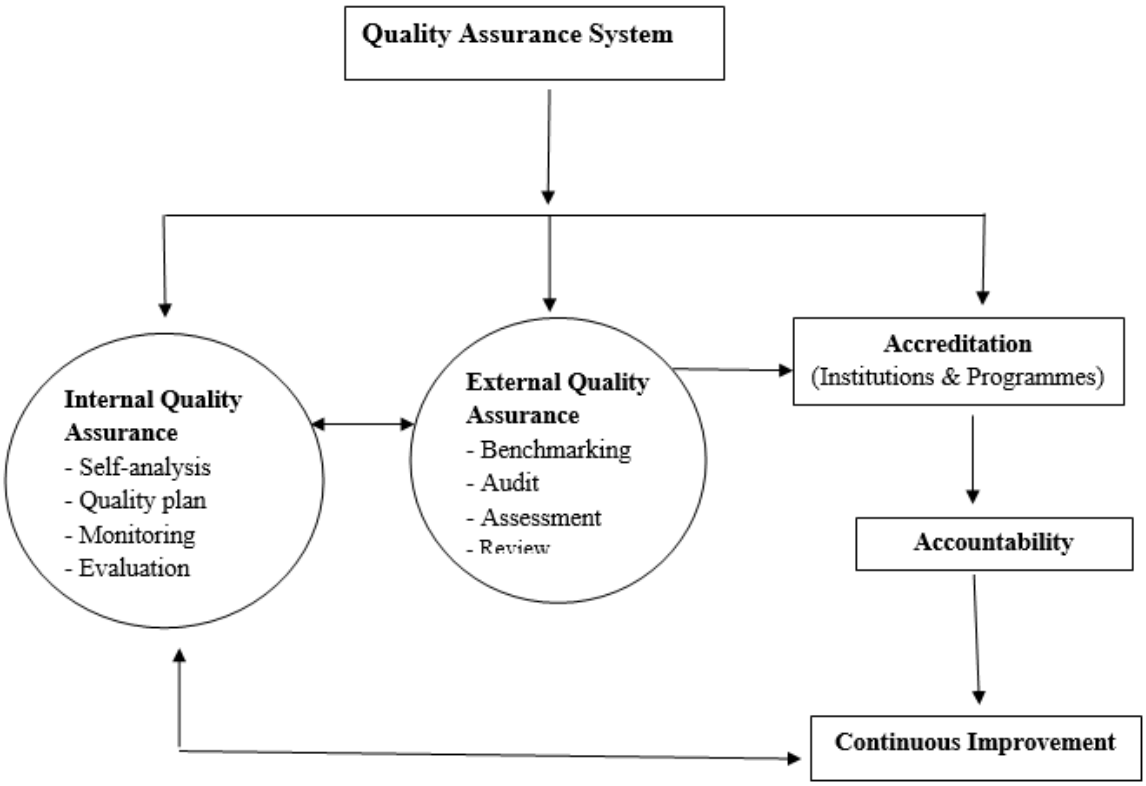

Fig. 1: Components of quality assurance in tertiary education
(Source: Machumu & Kisanga [36])

Zimbabwe's tertiary education is expected to have the capacity to produce products and services that fulfil the necessities of both internal and external clients. This creates the need to transform the current governance strategy to one that fosters efficiency and accountability [37]. In this case, the capacity of tertiary institutions to produce quality products and services depends upon some drivers, which emphasize improving organisational processes, practices, and strategies [38]. It is against this background that quality is viewed as an important aspect concept in this discussion since it is around which both private and public tertiary institutions build competitive brands. Therefore, quality in tertiary education includes, among other things an effective system of

marketing; appropriateness and adequacy of facilities; human capital's qualification and experience; relevancy of programmes on offer; aptness of teaching-learning material, and a robust complaint handling structure.

In tertiary education, there has been an increase in the need for institutions to give attention to accountability [39]. Thus, institutions have introduced some market-based reforms that increase professional accountability to both internal and external clientele [40]. In this context, accountability can be looked at as a procedure through which tertiary institutions are obliged to account for their actions, strategies, operations, etc. to both the internal and external clientele [41]. Through internal accountability, tertiary institutions have a commitment to account for their clientele [42]. It's important to note that external accountability mirrors at the overall performance of the tertiary institutions. In this case much emphasis in given to productivity, aligning individuals' work with the mission and the quality of the education system. This indulges tertiary institutions into push for the attainment of set goals in accordance with the legislated procedures and mechanisms. It is against these standards and regulations that regulatory bodies e.g., ZIMCHE or Department of Quality Assurance and Standards (QAS) - Ministry of Higher and Tertiary Education, Innovation, Science and Technology Development use to monitor operations in both private and public tertiary institutions [43]. This ensures that clients have access to and equal opportunities for quality products and services [44].

It is against this background that accountability calls for tertiary institutions to be answerable to their internal and external clientele, in terms of outcomes or performance [45, 46]. In Zimbabwe's tertiary education quality issues are addressed through accreditation, programme review, and assessment. For instance, ZIMCHE and QAS have the mandated to accredit institutions and programmes; assess qualifications; establish criteria and procedures for monitoring; and evaluating quality of operations in institutions [47]. This serves to validate an institution or a programme's extent of meeting the set quality standards [48]. On the other hand, programme review is seen as an internal function undertaken after a given period as specified by the guidelines [49]. This is grounded in much clearer and more transparent horizontal lines of decision-making in tertiary institutions' structures and operations [50]. Thus, each tertiary institution has the responsibility to design and implement its own internal quality assurance modus operandi guided by defined objectives [51, 52]. Therefore, a quality assurance system should be geared towards generating information about how institutions and their administrative departments/sections have thrived in their operations [53].

The information around the outcomes is communicated to the management, students, and human capital to enhance public confidence and trust in the quality of education. It is significant to acknowledge that external quality assurance leans towards reinforcing the sense of accountability for tertiary institutions' continuous improvement [54]. This is done when agencies (i.e., ZIMCHE or QAS) conduct audits targeted at assessing the extent to which institutions have achieved their objectives; establish whether or not their processes are effective. Through this, the system is expected to capture an array of indicators (i.e., both qualitative and quantitative) to make available comment concerning improvement to made on the programme(s) [55]. In addition, reports are made against a specified set of indicators of quality in education as outlined in ZIMCHE Act (Chapter 25:27) Sections 8, 9, and 10 and Manpower Act (Chapter 28:02) for universities and polytechnics respectively [56].

It is important to note that assessment emphases on outcomes, encompasses a narrower set of actions (than programme review), and is generally nonstop rather than interrupted [57]. Thus, the interaction between the internal and external quality assurance systems creates a network system in a complex tertiary education landscape through the provision of answers to the questions about who should be accountable and what level [58]. This brings to light that in tertiary education's structures and operations, accountability and continuous improvement are intimate, as accountability can always be re-articulated to focus on quality improvement [59]. Nevertheless, this calls for partnership of all those involved in tertiary education based on public interest and trust [60]. It's crucial to acknowledge that though there is an agreement amongst the stakeholders concerning the relevance of quality in tertiary education. However, consensus is yet to be reached on its conceptualization.

Therefore, quality in tertiary education can be conceptualizeddifferently depending on the context, for instance as a measure for excellence, perfection, value for money, customer satisfaction, fitness for purpose or change in students. This can can be acknowledged as a path way through which tertiary institutions transit in pursuit of producing goods and services that meet the expectations of the society. In this context, stakeholders (government, institutional leadership, students, industry, academic or non-academic staff, professions, etc) conceptualize quality in education differently based on their interests. However, all these stakeholders have similar expectations, that is tertiary education should produce students who are functional in their society. This brings to the fore-front the need for both public and private tertiary institutions to have quality assurance practices in place. These can be an effective instrument in helping tertiary institutions to accomplish quality product and service from the stakeholders' perspective. This also, has the potential to create a new quality 'life style' of the products and services from these tertiary institutions. This means that fostering of quality in tertiary education is expected to surpass the intangible and mechanical tasks of those involved in the organisational operations. In other words, it's expected to create an environment that also addresses moral and ethical aspects of quality in tertiary education.

CONCLUSIONS

It is indisputable that the existence of a quality culture fosters a greater linkage between the components of tertiary institutions. Therefore, institutions need to have their quality assurance policies and guidelines under the purview of a quality assurance directorate. Moreso, the directorate operates in accordance with the dictates of the national tertiary education quality assurance and standards policies (i.e., ZIMCHE Act (Chapter 25:27) Sections 8, 9, and 10 and Manpower Act (Chapter 28:02), in as far as what should be offered and to what extent it can be practiced. This brings to existence an appropriate quality assurance system to oversee the education and training structures with emphasis on the learning environment, curriculum and instruction, research output, etc. This forms the foundation that ensures the existence of checks-and-balance within the tertiary education systems. Thus, this discussion, revealed that Zimbabwe's tertiary education quality assurance system comprises components (i.e., internal and external quality assurance, accreditation, accountability, and continuous improvement), which are closely interconnected. This creates a sustainable network capable of transforming tertiary education system's structures and operations to be efficient market-oriented and profitable. It is suggested that although systems to the adherence to set standards and procedures are in place, there is still a need to adopt a quality culture in line with the demands of Zimbabwe's Heritage-Base Education 5.0 curriculum framework.

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Stakeholder Involvement and The Implementation of Maternal and Child Health Projects of Safaricom Public Limited Company in Siakago Sub-County, Embu County, Kenya

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Abstract:
This paper aims to assess the level of stakeholder involvement in the implementation of maternal and child health projects by Safaricom PLC in Siakago Sub-County, Embu County, Kenya. The study investigates various aspects of stakeholder engagement, including their roles, responsibilities, collaborative strategies employed, and their impact on maternal and child health projects. The research design utilized a cross-sectional survey, targeting a population consisting of 25 Safaricom Foundation staff, 7 community health workers, and 720 mothers who delivered in Siakago sub-county hospital between 2021 and 2022. A purpose sampling technique was employed to obtain the participation of 7 community health workers and 25 Safaricom staff. For the sample size of community health workers and Safaricom staff, a census approach was utilized due to the small population. Interviews were conducted to obtain data from a sample size of 256 mothers with children under 1 year old. Data collection involved structured questionnaires and interview guides, and analysis was performed using descriptive and inferential statistics. The results of the study indicate a strong positive relationship between stakeholder involvement and the successful implementation of maternal and child health projects, as evidenced by a correlation coefficient of 0.983. The coefficient estimates of 0.900 for stakeholder engagement suggests that increasing stakeholder involvement enhances the likelihood of successful project implementation. However, there were differing opinions regarding the potential impact of a lengthy hierarchical chain of command on decision-making processes. Based on these findings, several recommendations are proposed to strengthen stakeholder engagement. Prioritizing regular communication and collaborative decision-making is crucial for enhancing stakeholder involvement. Community engagement should be enhanced through comprehensive plans that incorporate community input and address their specific healthcare needs. Raising awareness and promoting education about maternal and child health practices are vital aspects to consider. Project management should optimize the chain of command and streamline decision-making processes. Additionally, conducting stakeholder analysis and sharing best practices and lessons learned are recommended for continuous improvement. In conclusion, this study sheds light on the significance of stakeholder involvement in the implementation of maternal and child health projects by Safaricom PLC. By implementing the recommended strategies, Safaricom can enhance the effectiveness of their projects and contribute to improved maternal and child health outcomes in Siakago Sub-County.

Keywords: stakeholder involvement, Implementation, Maternal and child health projects

INTRODUCTION

Stakeholder involvement is crucial for the successful implementation of maternal and child health projects Worldwide (Gupta, 2020; Simmonds, Pickett, & O'Brien, 2018). Engaging stakeholders allows organizations to effectively address the complex challenges associated with improving maternal and child health outcomes (WHO, 2019). This paper focuses on the stakeholder involvement and the implementation of maternal and child health projects by Safaricom PLC.

Maternal and child health is a global concern, particularly in developing countries, where significant challenges persist in ensuring the well-being of mothers and children (WHO, 2019). Every day, preventable causes related to pregnancy and childbirth lead to the deaths of approximately 810 women worldwide (WHO, 2019). Additionally, around 6.2 million children under the age of five die each year, with the majority of these deaths occurring in low-income countries (WHO, 2019). Achieving Sustainable Development Goal 3, which aims to ensure healthy lives and promote well-being for all at all ages, necessitates collaborative efforts from diverse stakeholders (UN, 2015).

Safaricom PLC, a leading telecommunications company in Kenya, recognizes the importance of maternal and child health and has undertaken proactive measures to address these challenges in various parts of Kenya. Through its corporate social responsibility initiatives, Safaricom has implemented various projects aimed at improving maternal and child health outcomes in the region. These projects encompass a range of interventions, including access to quality healthcare services, maternal education programs, community awareness campaigns, and the provision of essential medical supplies and equipment.

To ensure the success of these projects, Safaricom PLC has actively engaged multiple stakeholders at various levels. The involvement of stakeholders, such as local communities, government agencies, non-governmental organizations, healthcare providers, and community leaders, is essential for understanding the specific needs and challenges faced by the target population (Gupta, 2020; Simmonds et al., 2018). Furthermore, stakeholder involvement enables the identification of synergies, alignment of objectives, and mobilization of resources, ultimately leading to sustainable and impactful interventions (Gupta, 2020). This paper aims at exploring ways in which stakeholder involvement is likely to influence the implementation of maternal and child health projects by Safaricom PLC in Siakago Sub-County, Embu County, Kenya. In particular, the paper will present data on various stakeholders' engagement, their roles and responsibilities, and the strategies employed to facilitate effective collaboration influence the implementation of maternal and child care health projects.

Statement of the Problem

Maternal and child health remains a significant challenge in Kenya, with high maternal mortality rates and limited access to quality healthcare services, particularly in rural and underserved areas (United Nations Population Fund, 2020; KDHS, 2008). Despite efforts from various stakeholders, including the national government, county governments, NGOs, and corporate institutions like Safaricom PLC, the implementation of effective maternal and child health programs face numerous obstacles.

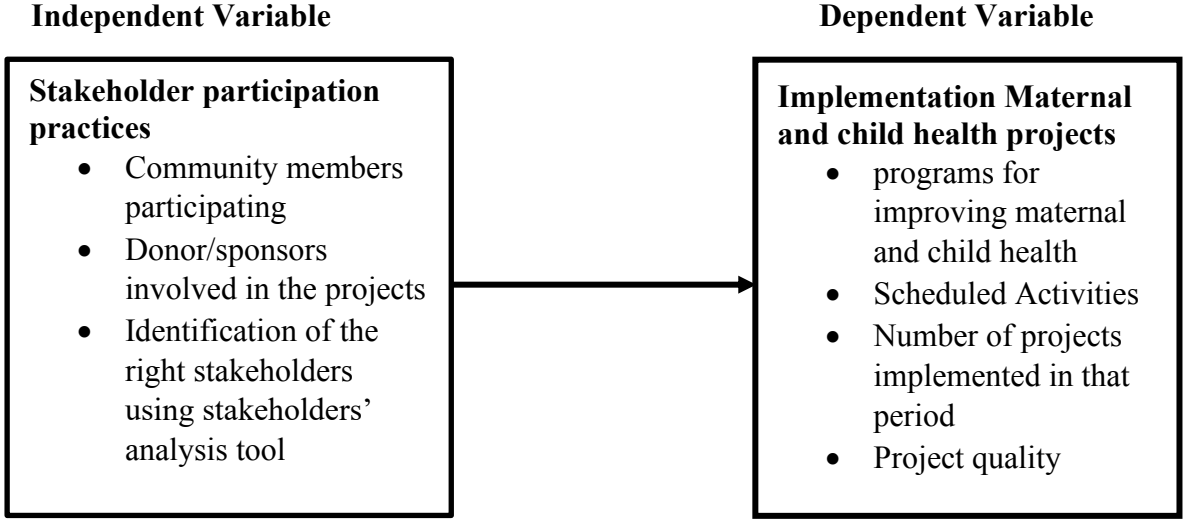
One of the key issues is the persistently high maternal mortality ratio, which indicates a high number of women and girls dying from pregnancy and childbirth-related complications (United Nations Population Fund, 2020). Although there has been a slight increase in the availability of

experienced birth attendants, a significant proportion of maternal deaths are still attributed to substandard treatment and inadequate healthcare (United Nations Population Fund, 2020). Additionally, women in rural and marginalized areas, such as Siakago Sub-County in Embu County, face greater challenges in accessing and utilizing maternal healthcare services compared to their urban counterparts (KDHS, 2008).

The low consumption of maternal healthcare services in rural and underserved areas contributes to the persistently high maternal mortality rates in these communities (KDHS, 2008). Despite the collaborative efforts of stakeholders, including Safaricom PLC, to improve the quality of maternal and child health services and programs, there are systemic challenges that hinder the effective implementation of these initiatives. The 2013 World Bank report highlights issues such as inadequate funding, poor administration, inadequate infrastructure development, corruption, and nepotism within the healthcare sector in Kenya (World Bank, 2013). These factors undermine the provision and implementation of programs aimed at improving maternal and child health, making it difficult to achieve the envisioned goals outlined in Kenya's Vision 2030 plan. In light of these challenges, it is essential to examine the extent to which stakeholder involvement influences the implementation of maternal and child health projects by Safaricom PLC in Siakago Sub-County, Embu County, Kenya.

CONCEPTUAL FRAMEWORK

The conceptual framework examines the relationship between stakeholder participation practices and the implementation of maternal and child health projects. Stakeholder participation practices consist of community members participating, donors/sponsors involved, and identification of the right stakeholders using stakeholders' analysis. Community members' active involvement in decision-making and program planning is crucial. Donors/sponsors provide financial support for project implementation. Identifying the right stakeholders helps facilitate effective collaboration. The implementation of maternal and child health projects depends on programs for improving maternal and child health, scheduled activities, the number of projects implemented, and project quality. Programs include prenatal care, safe delivery practices, and health education. Scheduled activities involve setting goals, monitoring progress, and establishing timelines. The number of projects implemented measures project quantity and service coverage. Project quality is assessed based on adherence to guidelines, healthcare accessibility, provider competency, and beneficiary satisfaction.



LITERATURE REVIES ON STAKEHOLDER PARTICIPATION PRACTICES AND THE IMPLEMENTATION OF MATERNAL AND CHILD HEALTH PROJECTS

Since the 1970s, the involvement of stakeholders has been widely recognized as an essential element of any program implementation (O'Brien, Phelan, Smith & Smits, 2021). Participation refers to the process of participation of all parties involved in decision-making which is influential in a positive contribution to society. According to World Bank, (2019), the process of stakeholder participation plays a key role in influencing development initiatives that consequently result in the efficient control of resources. In the past few decades, the development experiences have shown a positive impact on stakeholder involvement in the social sector evidenced by non-profit organizations and international funding agencies (World Bank, 2019). This evidence-based proof shows the reason why stakeholder involvement in decision-making has become a key factor in the development process.

The majority of community-based development projects have greatly benefited from stakeholder involvement. These projects emphasize the significance of beneficiaries' active participation in the decision-making process, which helps in program implementation. Succinctly, community-based projects that primarily rely on international funders can gain acceptance whenever they make stakeholder participation a central aspect of their activities. The active involvement of stakeholders in implementing the projects is aimed at making the development and implementation of the project more practical, efficient, and demand-driven. Nonetheless, the aspect of actively involving stakeholders in the project has not become a reality globally mainly due to a misunderstanding of the needs of the beneficiaries. According to Srinivasan and Dhivya, (2020), there is very minimal stakeholder participation in projects that involve the community as the primary beneficiary in Australia. According to Larsson and Larsson, (2020), many projects which have stakeholders as primary beneficiaries do not involve them in the implementation of project initiation to project phase-out. This has led to numerous implementation challenges. The MCH study within Siakago sub-County will investigate the level of stakeholder engagement especially the primary beneficiary and how the presence or lack of it might affect the project in the long run.

In Malaysia, Heravi, Coffey, and Trigunarsyah (2015) carried out an extensive study on the effect of stakeholder participation in enabling project planning and execution of processes. The research which included data from 200 companies deployed interviewing as the main method of collecting data. The respondents in the field of construction of residential buildings were issued with questionnaires. The findings revealed that the success of the building projects relied on active stakeholder involvement in decision-making processes. The findings further showed that the success and completion of most projects were dependent on the level of stakeholder engagement. Such approaches in the activities of the project effectively led to better project performance through the inclusion of key personnel and expertise which positively influenced the projects' performance. This research which was conducted in building projects entails evidence-based lessons, however the current study was done in the Maternal and Child Health, one of Safaricom's Corporate Social Responsibility.

According to Nashira (2021), a study conducted in Ghana, the challenges faced by organizations during the implementation of water and disinfection projects in the Gushegu Region were investigated. Nashira collected data through interviews and conducted semi-structured surveys using purposive sampling. The study aimed to uncover the reasons behind the limited involvement of project beneficiaries in the planning processes (Nashira, 2021).

The findings indicated that 54% of the participants (n = 135) agreed that stakeholders were not adequately engaged in the project planning phase (Nashira, 2021). Furthermore, the research revealed a misconception that beneficiaries did not have a significant role in decision-making, leading to only 54.8% of stakeholders being involved (Nashira, 2021).

Building upon Nashira's study, the present research addresses key gaps in understanding the importance of stakeholder involvement in the execution of maternal and child health (MCH) projects in the Siakago sub-county, Embu County. Nashira's study highlighted the challenges faced by organizations in engaging stakeholders, emphasizing the need to investigate the impact of stakeholder involvement on project execution (Nashira, 2021).

However, the current study focuses specifically on the MCH context in Siakago, aiming to fill the research gap identified by Nashira (2021). By examining how stakeholder involvement influences the execution of MCH projects, this research contributes to a better understanding of effective strategies and potential challenges in engaging stakeholders. In conclusion, Nashira's study provided valuable insights into the challenges organizations face in involving stakeholders during project implementation in Ghana. The present research builds upon these findings and addresses the gaps in understanding the significance of stakeholder involvement in MCH projects in the Siakago sub-county, Embu County, furthering knowledge in this area

In Tanzania's Mtwara region, Mwanga (2015) conducted a study to identify the factors influencing community involvement in the development of HIV and AIDS interventions. The study revealed limited stakeholder participation in these interventions. The sample consisted of 192 individuals from the target demographic, and a cross-sectional survey research design was employed. After randomly selecting participants from the target population, a questionnaire was distributed among 12 focus groups. The researcher purposively selected eight participants from each group based on their knowledge about the topic.

The findings of the study indicated that approximately 81.8 percent of the respondents did not actively contribute to the development of HIV/AIDS interventions (Mwanga, 2015). Building upon these results, the present research aims to evaluate the extent of stakeholder involvement in the planning process and their contributions to the implementation of maternal and child health (MCH) projects in the Siakago sub-County, Embu County. This study draws upon the insights gained from Mwanga's (2015) study and aims to address the research gap identified in their findings. Specifically, it seeks to explore stakeholder involvement and its impact on the implementation of MCH projects in the Siakago sub-County, Embu County, contributing to a deeper understanding of effective strategies and potential challenges in engaging stakeholders.

Sakwa and Ochieng (2018) conducted a study in Kisumu County, Kenya, to investigate the impact of participatory asset preparation on local water projects. The study employed correlational and descriptive research designs and involved a sample of 189 families out of a target population of 360. Correlational surveys were utilized as the primary data collection method, and the findings indicated a significant influence of participatory asset preparation on project execution.

Specifically, the statistical analysis revealed that both labor sourcing and finance mobilization had p-values of 0.000 and 0.003, respectively, below the significance level of 0.05. These results underscored the importance of providing training to community members to enhance their skills in project operation, maintenance, and effective implementation.

In light of these findings, the present study aims to address the research gap regarding the effectiveness of skill transfer in project execution and management. By assessing the level of skill acquisition among stakeholders involved in the implementation, operation, and maintenance of the project, this research seeks to provide valuable insights into the impact of skill transfer and bridge the existing research gap (Sakwa & Ochieng, 2018).

Additionally, Musau and Kirui (2018) conducted a related study focusing on the direct influence of project planning on the execution of government projects within district state-run administrations, specifically examining the Machakos Province Government. Employing a qualitative descriptive research approach, the study involved a sample of 90 participants, representing 30% of workers directly engaged in project execution. Data were collected through semi-structured surveys, and descriptive and inferential statistics were employed for analysis.

The findings of Musau and Kirui's study highlighted the active engagement of the district government in stakeholder participation during project planning. The research suggested the significance of capturing stakeholders' perspectives prior to and during project execution and aligning them with appropriate expertise and capability to develop effective project frameworks. Building upon these findings, the current study aims to investigate the influence of stakeholder involvement on the execution and management of maternal and child health (MCH) projects, with a specific focus on Safaricom's CSR initiatives in the Siakago sub-county, Embu Region. By addressing this research gap, the present study aims to contribute to a deeper understanding of the impact of stakeholder involvement and fill the existing gap in knowledge regarding the execution and management of MCH projects (Musau & Kirui, 2018).

METHODOLOGY

Cross-sectional survey design was used in this study. Cross-sectional survey design is an observation-based research technique that entails examining data gathered from numerous subjects all at once (Creswell, 2013). The advantage of cross-sectional surveys is that it provides data from a population at a particular time when compared with the other research designs (Creswell, 2013).

The study's target population included; 25 Safaricom foundation staff, 7 community health workers, and 720 mothers who delivered in Siakago sub-county hospital between the years 2021 and 2022 as shown in Table 1.

Table 1 Target Population

Respondent	**Population**
Safaricom Foundation Staff	25
Community health workers	7
Mothers	720
Total	752

Source: Embu County & Safaricom (2021-2022)

The procedure of selecting a predetermined number of subjects from a predetermined population set is referred to as sampling. It is highly recommendable to the researcher when selecting a sample to ensure it is a true representation of the population (Orodho, 2009). The study used purpose sampling technique to obtain 7 Community health workers and 25 Safaricom staff to participate in this study.

A sample size of 256 mothers with children under 1 year was employed in the study, according to the sampling formula presented by Yamane (1967) and accepted by Israel (1992).

$$n=N/(1+N(e)^2) \quad \text{.....1}$$

N is the size of the population, n is the sample size, and e is the level of accuracy or significance. Therefore: -

Sample size = $720/ (1+720(0.05)^2) =256$

Hence

The total sample size of respondents is 288

Table 2: Sample Size

Respondent	Population	Sampling Method	Sample size
Safaricom Foundation Staff	25	Census	25
Community health workers	7	Census	7
Mothers with children less than 1 year.	720	n=N/(1+N(e)^2)	256
Total	**752**		**288**

Source: Embu County and Safaricom (2021-2022)

Data for this study were collected using a structured questionnaire administered to 25 Safaricom Foundation Staff and 7 Community Health Workers, as they were deemed the most suitable respondents for questions regarding stakeholder engagement. Additionally, interviews were conducted with mothers having children under the age of 1 to gather information on the implementation of maternal and child health projects by Safaricom PLC in Siakago sub-county, Embu County, Kenya.

The collected data encompassed both qualitative and quantitative aspects. Quantitative data underwent a cleaning process to eliminate errors, followed by coding and recording into a spreadsheet for further analysis. The researcher employed the Statistical Package for the Social Sciences (SPSS) version 26 for data analysis, utilizing descriptive and inferential statistics. The inferential statistics employed included correlation analysis and linear regression.

For the interview data, a thematic analysis approach was utilized. The interviews were transcribed and carefully reviewed to identify common themes and patterns within the responses. Codes were then assigned to the identified themes, facilitating the organization and categorization of the qualitative data. The researcher systematically analyzed the coded data to extract meaningful insights and draw conclusions.

By combining both quantitative and qualitative data analysis techniques, this study aimed to provide a comprehensive understanding of the stakeholders' engagement and the implementation of maternal and child health projects by Safaricom PLC in Siakago sub-county, Embu County, Kenya.

PRESENTATION AND DISCUSSION OF FINDINGS

Questionnaire Return Rate

The study had a sample size of 288 participants, which included 25 Safaricom Foundation Staff, 7 Community Health Workers, and 256 mothers with children less than 1 year old. After data collection, a total of 32 respondents (25 Safaricom Foundation Staff and 7 Community Health Workers) successfully answered and returned the questionnaires, resulting in a questionnaire return rate of 11.1%. Furthermore, the study conducted interviews with 180 out of the 256 eligible mothers, resulting in an interview rate of 70.3%.

Stakeholder Engagement and Maternal and CHILD HEALTH PROJECT

The aim of the study was to find out how stakeholder engagement affected how effectively Safaricom carried out its projects for maternal and child health. The results are explained in Table 3

Table 3: Stakeholder Engagement and Maternal and child health project

Descriptive Statistics					
	N	Minimum	Maximum	Mean	Std. Deviation
We engaged the community members by asking them the status of health in Siakago	32	4.00	5.00	4.0625	.24593
Creating awareness of the importance of Ante Natal Check-ups	32	4.00	5.00	4.9375	.24593
Creating awareness of importance Post Natal Check-ups	32	4.00	5.00	4.0625	.24593
We engaged donors/sponsors to build and equip at least maternity wings	32	4.00	5.00	4.9375	.24593
To assist pregnant women in rural locations to access healthcare facilities, we enlisted donors and sponsors to supply ambulances.	32	4.00	5.00	4.9375	.24593
Provide new delivery beds that are adjustable in several positions which will not hurt mothers while they are delivering.	32	4.00	5.00	4.9375	.24593
We engaged the following county government of Embu	32	4.00	5.00	4.9375	.24593
We engaged the Amref	32	4.00	5.00	4.9375	.24593
We engaged the National government	32	4.00	5.00	4.9375	.24593
We engaged volunteers' community health workers	32	4.00	5.00	4.9375	.24593
Valid N (listwise)	32				

The study revealed that, on average, respondents actively engaged community members in Siakago by inquiring about their health, with a mean score of 4.0625. Additionally, a significant number of participants strongly agreed that they were involved in raising awareness of the value of prenatal exams (mean = 4.9375) and postnatal exams (mean = 4.0625). The median score of 4.0625 indicated that respondents recognized the importance of engaging community members by asking about their health.

Furthermore, participants strongly agreed (mean = 4.9375) that they reached out to project recipients through door-to-door campaigns, demonstrating a proactive approach to

disseminating information. The project's chain of command was generally perceived as producing clarity and accountability, as indicated by the mean score of 4.0000. However, opinions were divided regarding whether the lengthy hierarchical chain of command during the project phase impeded decision-making, with a mean score of 3.1250.

These findings have several implications for the successful implementation of maternal and child health projects. Firstly, they emphasize the importance of community engagement and active involvement in health-related matters. This highlights the need for ongoing communication and interaction with community members to ensure their participation and support. Secondly, the results underscore the significance of raising awareness about prenatal and postnatal exams, as this can contribute to improved health outcomes for mothers and children.

Additionally, the study indicates the importance of effective project management and clear accountability within the project's chain of command. This suggests the need for streamlined decision-making processes and efficient communication channels to ensure timely project execution. It is crucial to address any potential delays or obstacles that may arise due to hierarchical structures, as reflected in the differing opinions regarding decision-making.

By considering these implications, stakeholders can enhance the implementation of future maternal and child health projects. Through improved community engagement, awareness campaigns, and effective project management, they can promote positive health outcomes for mothers and children in Siakago and similar contexts.

IMPLEMENTATION OF MATERNAL AND CHILD HEALTH PROJECT

To determine how much respondents agreed with the opinions given in each item, as indicated in Table 4. the mean of each item was calculated.

Table 4 Implementation of Maternal and child Health Project

Descriptive Statistics					
	N	Minimum	Maximum	Mean	Std. Deviation
The types of maternal and childcare projects initiated in Siakago have helped in reducing the rate of mortality rate in Embu county	32	4.00	5.00	4.9375	.24593
Over 50% of women in Embu County have benefited from maternal health interventions by Safaricom Foundation	32	4.00	5.00	4.9062	.29614
After the completion of the project in the county they have been improvement with 80% skilled deliveries, reducing the risk of maternal and infant mortality	32	3.00	5.00	4.9062	.39015
Valid N (listwise)	**32**				

The findings presented in Table 4.5 provide valuable insights into the effectiveness of the maternal and child care projects initiated in Siakago by Safaricom Plc. The high mean scores indicate a strong agreement among participants that these projects have successfully contributed to a reduction in mortality rates in Embu County, benefiting both mothers and children. Moreover, the study findings reveal that over 50% of women in the county have benefited from

the maternal health interventions facilitated by Safaricom Foundation, emphasizing the positive impact of accessible and beneficial maternal health services.

These significant findings have important implications for the implementation of the Maternal and Child Health Project by Safaricom Plc. They demonstrate the successful execution of the project, ensuring that residents in Siakago have access to essential maternal and child health services. The firsthand accounts shared by Interviewees 1 and 2 further validate the positive impact and benefits experienced by individuals, reinforcing the effectiveness of the project in improving health outcomes.

"I benefited from MCH health facilities by getting education on good nutrition practices to enable good growth of my fetus''

"I benefit by getting tested HIV infections and was educated on how to prevent passing the virus to my baby"

Interviewee 13 and 25 had this say respectively;
"Have never benefited from Maternal Child health Facilities since my First-born child I delivered at home assisted by a mid-wife."
"No have never benefited from Maternal Child health Facilities since the health facilities are far from our homestead and there are issues on transport"

Interviewee 35 and 67 had this to say
"Yes it I have benefited because have been given a nutrition plan for my child when she was six months"
"Yes I have benefited because I was given family planning services"

Interviewee 45 and 100 had this to say;
"Yes was able to be given all immunization and vaccine at no cost"
"Yes I have benefited because when I was pregnant my child was breeched and the gynecologist was able to re position the baby"

Interviewee no: 14 and 18 had this to say about seeking additional services for your herself and the child at the health facilities after delivery
"No! because the health facility is far from where I live and I don't have financial resources for transportation means".
"No! because I delivered at home and I didn't know am supposed to visit the clinic"

Interviewee 100 and 109 had this to say respectively
''yes, I seek family planning services for myself after delivery and the health practitioner was very detailed on explaining to me the types of family planning methods and their side effects and helped me to pick the most appropriate for me.''
''Yes, I seek the services of my child immunization which were offered at no cost.''
Interviewee 27 and 48 had this to say respectively
''Yes, I went to the health facility to seek medical checkup for my child who developed flu after we were discharged from the facility and I received the drugs.''

''Yes, I went to the facility to seek help after I realized I have got infections from the wound which was stitched after delivery and I received treatment and medical advice on how to care for the wound.''

According to the report, Safaricom Plc's Maternal and Child Health Project has been successfully implemented. This was because the vast majority of moms commented favorably on the quality of the services they received at the Siakago health center. The project's goal of providing Siakago residents with access to maternity and child health services had been achieved. The results support the claims of mothers who said they had children at the Siakago MCH facility and had a positive experience. The results of this study are consistent with those of WHO (2019), which emphasizes the need of funding appropriate maternal-child health care initiatives because doing so will benefit Kenya's economy and directly lower poverty rates. Even while the Kenyan government has achieved some considerable progress toward achieving SDG target 3.1, which aims to dramatically lower maternal deaths and infant mortalities by 2030, many different factors have been at work. The government requests assistance from donors and well-wishers because it is unable to take all the necessary steps to improve MCH there.

The implementation of Safaricom Plc's Maternal and Child Health Project has been highly successful, as indicated by the positive feedback received from the majority of mothers who utilized the services at the Siakago health center. The project effectively accomplished its objective of providing access to quality maternity and child health services for the residents of Siakago. The study findings align with the World Health Organization's (WHO, 2019) recommendations, highlighting the importance of funding appropriate maternal-child health care initiatives, which can contribute to Kenya's economic growth and poverty reduction efforts.

Although the Kenyan government has made significant strides towards achieving Sustainable Development Goal (SDG) target 3.1, which aims to reduce maternal and infant mortality rates by 2030, several factors continue to impact the overall progress. The government acknowledges the need for support from donors and well-wishers to address the diverse challenges associated with improving maternal and child health. Their assistance is crucial in ensuring that comprehensive steps are taken to enhance the quality and accessibility of maternal-child health care services.

In summary, Safaricom Plc's successful implementation of the Maternal and Child Health Project is evidenced by the positive experiences reported by mothers at the Siakago health center. This achievement aligns with global recommendations and emphasizes the importance of sustained funding for maternal-child health care initiatives. While the Kenyan government has made significant progress, external support remains necessary to further enhance maternal and child health care in the country.

Correlation

The analysis revealed that independent variables affected dependent variables. This was achieved using the correlation of Pearson. The findings are shown in Table 5

Table 5. Correlation

		Implementation of Maternal and child health Project	Stakeholder engagement
Implementation of Maternal and child health Project	Pearson Correlation	1	.983**
	Sig. (2-tailed)		.000
	N	32	32
Stakeholder engagement	Pearson Correlation	.983**	1
	Sig. (2-tailed)	.000	
	N	32	32

The results show that stakeholder involvement influenced strongly the implementation of MCH projects (r= 0.983**). Stakeholder engagement was found to influence the implementation of maternal and child health projects (r= 0.983**). The findings concur with those of Heravi, Coffey, and Trigunarsyah (2015) who found that active stakeholder participation in decision-making processes was crucial for the success of building projects in Malaysia. According to the research, the degree of stakeholder engagement was a key factor in the success and completion of the majority of initiatives. Through the inclusion of important persons and skills that positively impacted the projects' performance, such approaches in the projects' activities effectively led to better project performance. The results are consistent with those of Nashira (2021), who discovered that stakeholder involvement is crucial during the implementation phase and that excluding them can result in future, unforeseen difficulties.

Table 6: Coefficient estimate

Coefficients						
Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig.
		B	Std. Error	Beta		
1	(Constant)	.976	.651		1.499	.141
	Stakeholder engagement	.900	.163	.810	-5.536	.000
a. Dependent Variable: Implementation of Maternal and Child health projects,						

The study conducted a regression analysis to examine the relationship between stakeholder engagement and the implementation of maternal and child health projects. Consistent with prior research findings, the results showed a positive and statistically significant relationship between stakeholder engagement and the implementation of these projects.

The coefficient estimates of 0.900 for stakeholder engagement suggest that an increase in stakeholder involvement is associated with a higher likelihood of successful project implementation. This finding is consistent with previous studies that have highlighted the importance of stakeholder engagement in promoting project success and effectiveness (Heravi, Coffey, & Trigunarsyah, 2015; Nashira, 2021; Sakwa & Ochieng, 2018). Stakeholders, including community members, donors/sponsors, and the identification of the right stakeholders through stakeholder analysis, play a crucial role in decision-making, program planning, and project execution (World Bank, 2019).

The statistically significant beta coefficient of 0.810 further supports the idea that stakeholder engagement has a substantial impact on the implementation of maternal and child health

projects. This finding aligns with the literature, which emphasizes the positive influence of stakeholder involvement on project performance and outcomes (Heravi et al., 2015; Musau & Kirui, 2018). Engaging stakeholders effectively enables the inclusion of diverse perspectives, expertise, and resources, leading to better project performance and improved health outcomes for mothers and children (Mwanga, 2015; Nashira, 2021).

CONCLUSION

In conclusion, the positive relationship between stakeholder involvement and the implementation of maternal and child health projects, as indicated by the strong correlation coefficient of 0.983, emphasizes the significance of stakeholder engagement in project success. The coefficient estimates of 0.900 for stakeholder engagement suggest that increasing stakeholder involvement enhances the likelihood of achieving successful project outcomes.

Additionally, the study's descriptive statistics reveal the need to carefully consider the structure of the project's chain of command. While the project phase's chain of command was generally perceived positively, there were divided opinions regarding the potential impact of a lengthy hierarchical structure on decision-making processes. This implies the importance of ensuring efficient decision-making by addressing any potential drawbacks associated with the project's organizational structure.

By recognizing and addressing these implications, stakeholders involved in maternal and child health projects can enhance project implementation and ultimately improve health outcomes for mothers and children. Engaging community members, promoting awareness, and involving stakeholders effectively will contribute to better project performance and successful delivery of healthcare services. Project planners and managers must consider these findings and implement strategies that prioritize community engagement, stakeholder involvement, and efficient decision-making processes in future initiatives.

RECOMMENDATION

Based on the findings and implications of this study, several recommendations can be made to enhance the implementation of maternal and child health projects:

1. Strengthen Stakeholder Engagement: Given the significant positive impact of stakeholder involvement on project implementation, it is essential to prioritize and actively engage stakeholders throughout all stages of the project. This includes community members, donors/sponsors, government agencies, and relevant organizations. Strategies such as regular communication, collaborative decision-making, and involving stakeholders in project planning and evaluation should be implemented.
2. Enhance Community Engagement: The study highlights the importance of engaging community members in project activities. It is recommended to develop comprehensive community engagement plans that involve seeking community input, incorporating their perspectives, and addressing their specific healthcare needs. This can be achieved through methods such as community meetings, focus groups, and participatory approaches to ensure community ownership and sustainability of the projects.
3. Promote Awareness and Education: Raising awareness about the importance of maternal and child health practices, such as prenatal and postnatal exams, is crucial. Implementing targeted awareness campaigns using various channels, including community events, media platforms, and interpersonal communication, can effectively disseminate information and empower individuals to make informed decisions about their health.

4. Optimize Project Management: Project planners and managers should carefully consider the structure of the project's chain of command. While a positive perception of clarity and accountability was observed, concerns were raised about the potential impact of a lengthy hierarchical structure on decision-making processes. It is recommended to streamline the decision-making process, minimize bureaucratic hurdles, and foster a collaborative and agile working environment.
5. Conduct Stakeholder Analysis: Before project initiation, stakeholders should be identified through a systematic stakeholder analysis process. This will ensure that all relevant stakeholders are identified, their interests are understood, and appropriate engagement strategies are developed. Regular reassessment of stakeholders throughout the project lifecycle is also recommended to adapt to changing dynamics and address emerging needs.

By implementing these recommendations, stakeholders involved in maternal and child health projects can maximize the positive impact on health outcomes and contribute to the overall well-being of mothers and children in the community.

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Comparative Effectiveness of Non-Digital Game-Based Learning and Computer Simulated Instructional Methods on Academic Performance and Retention in Calabar Education Zone, Nigeria

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Abstract:
The research examined the comparative impact of non-digital game-based learning (NDGBL) and Computer Simulation instructional methodologies on students' performance on the concept of chemical bonding in Calabar Education Zone, Nigeria. Three research questions and hypotheses guided the study. Non-randomized pre-test, post-test quasi-experimental research design was adopted.122 Senior Secondary School One (SS1) Chemistry students selected using the Multistage sampling technique made up the sample. Chemical Bonding Achievement Test (CBAT), with a reliability index, which stood at 0.78 was the instrument used for data collection. Information produced from the pre-test, post-test and retention test were analyzed utilizing Mean, Standard Deviation, and ANCOVA at a significance level of.05. The result indicated that learners who were taught with non-digital game-based learning and computer simulation strategies did not differ significantly in academic outcome, There was a significant difference in the retention of students in the concepts taught using NDGBL and Computer Simulation in favour of students in the NDGBL group.Gender was also not found to be significant on students' learning outcome. It is recommended that teachers of chemistry employ game-based and simulation instructional methods in teaching chemistry. This encourages students to take an active role in the construction of knowledge. It boosts engagement through collaboration, improves interest and concentration as well as stimulates motivation which has the effect of improving learning outcomes and retention of concept learned.

Keywords: Non digital game-based learning, Simulation, Achievement, Retention, Gender

INTRODUCTION

Nations, particularly developing nations like Nigeria, are making frantic efforts to technologically and scientifically develop their economy; these have resulted in changes in educational goals and objectives. Effective science instruction requires effective instructional media. Therefore, the quality of instruction in the classroom is largely responsible for the quality of education. Chemistry is one important subject taught in high schools in Nigeria and learners are expected to pass at credit level as a requirement for entrance into tertiary organizations to study STEM based programs. The statistics summary of the performance trend in the subject from 2018 to 2022 conducted by the West African Examination Council shows that, despite Chemistry's central and important position among other sciences and related disciplines, students' performance on the senior secondary school certificate examination has consistently declined over time. Mapulanga (2019), investigated factors that influence the performance of students in science, several factors were identified such as poor study habit, infrastructural problem, low retention, teachers' attitude towards work, gender and use of ineffective instructional methods. Of all these variables, teaching strategy is found to be the most implicated factor. Chemistry teachers have advocated for efforts to use student-centered instructional strategies to improve instructional delivery (Udofia & Edem, 2019). The teaching of chemistry necessitates the application of a suitable instructional strategy that is capable of fostering an interactive learning environment for meaningful learning and comprehension of concepts, which improves academic achievement and subject retention. Educators believe that engaging and fun-based teaching approaches, in which students gain direct experiences through active participation in the learning experience, can help students overcome the challenges of learning scientific concepts. The majority of educational experiences have undergone significant transformations as a result of the development of digital technology. With this far and wide pattern, it has become principal to address the difficulties and assumptions of 21st-century students and furnish them with choices and new learning approaches equipped for answering students' as well as educators' developing interest and perspectives in innovation-based learning opportunities in science (Council of Europe, 2015). As a result, teachers of chemistry need to be familiar with a wide range of novel teaching methods that take into account the immense complexity of the concepts they are teaching. Learners' capacity to retain learned concept could improve assuming teachers utilize educational techniques that would upgrade powerful absorption of data towards significant review and recovery when the need emerges. In many educational and training settings, Interactive computer programs are used to educate both young and adult students in many educational and training settings. This has been observed to be beneficial and impactful in the teaching and learning of science. Computer-based instructional strategies like simulation and game-based learning (GBL) are considered effective alternatives to traditional teaching strategies. According to Karagiorgas & Niemann (2017), gamification is the application of game mechanics and components in a non-game setting. One of the teaching trends of the 21st century is game-based learning (GBL), in which the game is the learning Ahmad & Ikasan, (2021). The use of game in learning aims to accomplish a specific learning objective, which has recently received a lot of academic attention (Zou, 2020). This study, looked into at the application of NDGBL and simulation strategies in classrooms. Despite the strong case for NDGBL strategy, there exist insufficient literatures regarding their efficacy, particularly in terms of helping students succeed in secondary education.

According to Makalintal and Nerrie (2019) and Etiubon et al. (2022), GBL exercises can be utilized to propel students as well as assist them with creative capabilities, mental capacities, decisive reasoning, critical thinking, and computational abilities. There hasn't been much research done on the subject of incorporating games into classroom instruction. Using GBL as a tool in science

helps develop interest, perseverance, concentration, content mastery, appropriate science communication, and visual skills, all of which are necessary for learning chemistry. Computer simulation has received various interpretations from various authors. According to Kruger et al. (2022), the virtual experience is an imitation of frameworks used to focus on the unique behavior of articles or frameworks under circumstances that will not be quickly or securely applied in reality. Computer simulation, as defined by Okolo and Oluwasegun (2020), is the creation of a model by a computer, which is an improved device in which the processes of motion, sound, and image are synchronized and projected for effective education. A learner can use this kind of artificial creation to learn more about a concept or process that they can't learn from just experimenting.

Understanding, comprehension, and application of chemistry concepts to everyday life all depend heavily on retention. Because only a learned experience can be remembered, and learning cannot be considered to have occurred without adequate retention, it is a significant learning variable. According to Bakunola and Idowu (2012), retention is the capacity to hold, keep, or recall previous experiences and reproduce learned concepts when required. For knowledge to develop, these acquired materials in the mind must be preserved in images. To make learning meaningful, images that are retained are revived or reproduced in a simulating situation. As a result, concepts in chemistry should be presented to students in a manner that permeates their subconscious, leading to the ability to recall the learned concept. It is one of the things that could affect how well students do in school. One of the goals of science instruction and learning is for students to be able to recall previously learned science concepts, which may likely help them do better in science. Kurumeh et al. (2016) stated that teachers' choice of instructional method affects students' retention. Retention is greatly impacted by any instructional method that effectively engages students. As a result, teachers of chemistry might be able to improve their students' retention skills by employing methods that encourage students to effectively assimilate new information so that it can be meaningfully remembered and retrieved at any time. Kamarudin et al. (2019), claim that a conventional approach results in a low level of student interest in education. Few studies exist on the use NDGBL strategies in classrooms to improve performance and retention, specifically to encourage peer association and student commitment. This study intends to address this gap.

LITERATURE REVIEW

Game-based learning and computer-simulated instruction are learning trends of the 21st century that have received increasing academic attention (Ahmad & Iksan, 2021). Hui and Mahmud (2023), observed that the integration of games into education frequently outperforms the conventional strategy when it comes to increasing motivation, concentration, and active participation in the learning process. Balakrishna (2023) looked into how first-year computing qualification students' academic performance, engagement in the classroom, and peer interaction were affected by in-class, NDGBL method. The outcomes authenticated the discoveries from past investigations and featured how scholarly execution, study hall commitment, and companion association significantly improved. In chemistry classrooms, GBL has arisen as one of the most gainful educational strategies due to its emphasis on hands-on and mind-on activities. Hamid et al. (2022), examined the effects of NDGBL method and the cognitive level questions in determining student achievement in mathematics, the result showed that student who learned using NDGBL performed better than those in the traditional class. Similarly, Yeboah et al. (2023), observed that the integration of NDGBL motivate students to come to school, actively engage in the learning process, helps students easily assimilate content,

makes lesson lively and fun and builds collaborative skills among students. Byusa et al. (2022), researched on the impact of game-based learning on learners' motivation and comprehension of chemistry concepts. The result showed that educational games increase students' motivation to learn and have fun while understanding the material. Daubenfeld and Zenker (2021) discovered that a game-based approach decreased the failure rate of an undergraduate physical chemistry course. In similar vein, Killic and Gurbuz (2022) study on the impact of instructive game exercises on learners' accomplishment in science training was positive. Naderi and Moatian (2023), studied the effect of NDGBL and digital game-based learning over pupil's vocabulary learning and retention. The result indicated that NDGBL outperformed the digital group in achievement and retention demonstrating that appearance of innovation shouldn't cause us to overlook the advantages of NDGBL in education. Similarly, Chong et al. (2022) also observed that NDGBL intervention significantly improved the performance of students in the operations of integers. Nja et al. (2017) observed that utilizing kitchen resources as a game in teaching the concept of electronic configuration enhanced cognitive outcomes with gender not being statistically significant. Cahyan et al. (2017) also found that students' chemical learning outcomes improved when they used game-based learning. Fotokun et al. (2016) examined the effect of game-based learning on the concept of periodicity among chemistry learners. The conclusion was that learners instructed with the game strategy performed better academically than learners instructed with the traditional strategy. Gender showed no significant influence on performance and retention. Canacho-Sanchez et al (2022), observed a significant difference in academic performance and motivation when educational game is employed in teaching. Alvarez-Herrero and Valls-Bautista (2021) noted that gender was not significant in the performance of learners when instructed in chemistry with games. Blanie et al. (2020) also observed that game-based learning facilitates and improve learning outcome, especially complex concept. Mohd and Yusof (2021), investigated the effectiveness of NDGBL approach by assessing the differences in student achievement score on multiplication and division with indices. The result indicated that the integration of NDGBL approach had a positive effect on student's achievement. Fang et al. (2016) discovered significant differences between NDGBL and digital game-based learning (DGBL). According to the study, playing non-digital games gave students a sense of familiarity, empathy, and contentment that was greater. Rahutami et al. (2019) added that NDGBL had an impact on education of students in a more comprehensive manner because of the immediate contact, for example, visual, discourse in NDGBL, dissimilar to DGBL, where contact is restricted to discourse/sound. As a result, the study concluded that NDGBL improved outcomes in terms of respect for adversaries, critical thinking, cooperation, and communication.

An instructional simulation is a method that creates an artificial reality in a classroom setting in a systematic way. This artificial reality helps a student explore, navigate, or learn more about a system or environment that can't usually be learned through simple experimentation. Students are able to deal with pressing issues in a realistic manner through simulation without having to worry about the daring consequences. It enhances students understanding of complex interactions; improves critical and evaluative thinking among students, thereby eliciting the desired morale needed to boost Chemistry performance. Omoniyi (2021) looked into how well the lecture method (LM) and the four-mode application technique (fourMAT) of the computer simulation instructional package (CSI) helped students perform better in chemistry. The result demonstrated a significant difference in how well CSI and 4MAT affected chemistry performance among students. CSI was viewed as more powerful than 4MAT. In a similar vein, Jere (2020) examined the impact of computer simulation-based instruction (CSBI) in the subject of chemistry on the academic performance of students in the 12th grade. The performance scores were

significantly higher for students who were taught with CSBI, according to the outcome. According to Alake and Olojo (2020), the use of the Computer Simulation package has a significant impact on students' academic performance, while Lasisi et al. (2021) showed that when abstract science concepts were taught using computer simulation, students' academic performance was not significantly affected by gender, and that simulation improved students' understanding of abstract concepts

Nkemakolam et al. (2018), found that students did better in Chemistry when they used computer simulations than when they used lecture method, Gender was not significant in student achievement. Uzezi and Deya (2020) examined the impact of PC-reproduced educational procedures on science students' scholarly accomplishment in Acid-Base reactions with those in virtual experience achieving better over those in traditional strategy. Alhadlaq (2023) looked into Saudi students' attitudes and experiences with using computer simulations to teach science concepts without supervision. He found that participants were highly engaged and satisfied with using simulations for science learning without supervision. The teaching and learning of science were found to be significantly influenced by gender. Chumba *et al.* (2020), also found that the utilization of simulation in science improved performance in science

Gender is the socially constructed roles, behaviors, activities, and characteristics that a society deems fit for males and females, states World Health Organization (2015). It influences the perspectives, jobs, obligations, and ways of behavior of young men and young ladies in all social orders. Gender differences are actual disparities in typical behavior or average ability. Stereotypes about female inferiority in science and mathematics are prevalent among children and adolescents. According to Omenka and Kurumeh (2013), gender bias persists in Nigeria's science classrooms, where male students are portrayed as science experts and the learning task has different objectives for boys and girls.

Notwithstanding, in certain examinations, it was seen that young men and young ladies are at equivalent execution levels in their accomplishments in science. As a matter of fact, previous studies have shown the positive effect of using computer simulation and games in the teaching and learning of science, however, fewer studies exist on the adequacy of NDGBL strategy in improving performance in chemistry and the effectiveness of both simulation and NDGBL when compared remains unclear.

The motivation behind this research was to examine the relative viability of NDGBL and simulated instruction in improving learner's active participation and commitment to their learning, by allowing students to actively interact with the game activities. In Nigeria, the education sector receives the least amount of money from the national budget and has consistently failed to meet the recommended benchmark of 15% to 25% set by the United Nations Educational Scientific and Cultural Organization (UNESCO). The highest allocation in the last ten years was 10.7% in 2015, and the lowest allocation was 5.14 percent in 2021, indicating a 0.01% increase from 2020 despite calls for the government to provide more money to the sector. Inadequate funding has resulted in a lack of facilities and resources for science instruction. Getting smart boards, PCs, tablets and free Wi-Fi access in Nigeria is a tall dream or a delusion, in Nigeria majority of Schools are yet to fully experience the huge benefits of integrating ICT into the educational system due to the lack of funds to equipped schools. The result of the current state of education in Nigeria had led to lack of interest in chemistry and science subjects which had led to a corresponding decline in chemistry achievement and subsequent low enrollment into studying chemistry-based courses in higher

institution. In order to remediate this deficiency in school chemistry, it has become imperative to focus on available, fresh innovative techniques in the teaching of chemistry that would be effective, efficient and productive in enhancing student's interest and cognitive outcome as well as bridge the gap between the schools that have ICT labs and those that don't in Nigeria. This study looked at the comparative effectiveness of NDGBL and computer simulation in teaching chemistry with the view that the outcome will help militate against the divide, creating an equally effective alternative instructional strategy for improving student's interest and enhancing performance and retention of learned concept. The pilot study was conducted within this context.

THEORETICAL FRAMEWORK

The research is based on constructivist and situated learning theory. In the context of this study, learner-centered practice naturally lends itself to the constructivism approach of Von Glasersfeld (1995), viewed learning as the construction of knowledge with the aim of concept development and completes comprehension. Students learn the most when they actively participate in the constructing their own knowledge through experiential and interactive learning activities, according to constructivism. Lave (1988) argued that the activity, context, and culture in which learning takes place are all important factors. He further expressed that social communication is a basic part of learning where students become engaged with a "local area of training" which epitomizes specific convictions and ways of behavior to be procured. The general theory of knowledge acquisition known as situated learning has been implemented in technology-based learning activities that emphasize problem-solving abilities. This theory's guiding principle is that knowledge must be presented in an authentic setting, context, and application. Game-based learning and computer simulation are essential components of Situated Learning Theory, which asserts that learning should be embedded within activity context, authentic contexts, settings, and situation, that typically involve social interaction and collaboration. In this study students effectively partook in the development of the dice utilized for the study, consequently being active participant in the learning experience.

The Gap

Studies on game-based learning focus on digital game-based learning strategies, while a few focus on techniques for NDGBL in education in general, previous studies found that NDGBL made learning more fun and engaging, which in turn improved performance. In addition to promoting an interactive learning environment, a well-planned NDGBL strategy can improve communication skills, teamwork and decision-making abilities. The advantages of the NDGBL method have been confirmed in a few previous studies in courses, including English sentence structure (Cesur and Ozisler, 2019), science (Ramly et al. 2017), and chemistry (Bankole, 2018). However, very few studies have examined how student engagement and cognitive outcome are affected by classroom game-based learning that is not digital (Silveira, 2020). This study fills this void by comparing the efficacy of non-digital game-based learning strategies and simulated instruction with regard to student academic outcomes and retention.

Research Questions

1. What is the difference between the mean performance scores of students instructed chemical bonding using NDGBL and those instructed using Computer Simulation strategy?
2. How do the mean performance scores of boys and girls taught about chemical bonding with NDGBL and computer simulation differ from one another?

3. How does the mean retention scores of learners taught chemical bonding with NDGBL compared with those instructed with Computer Simulation?

Research Hypotheses

1. The mean performance scores of students who learn chemical bonding through NDGBL and computer simulation are not significantly different.
2. When compared to students who were taught chemical bonding through NDGBL and computer simulation, the mean performance scores based on gender are not significant.
3. The average retention scores of learners instructed on chemical bonding using NDGBL compared with those instructed using Computer Simulation are not significantly different.

METHODOLOGY

Population of the Study

The population comprised of 3,985 Senior Secondary School One (SS1) Chemistry students from 80 public schools in Calabar Education Zone. This is because chemical bonding is covered in their curriculum; this group is thought to be the best fit for this study. It is also assumed that the students had no prior knowledge of the subject under investigation. The researcher was able to investigate students' academic achievement and concept retention.

Design of the Study

Quasi-experimental design was adopted. Specifically, the study used a non-randomized pre-test, post-test group design with a 2 x 2 factorial arrangement. The factorial design was chosen because it made it possible to evaluate the outcomes of the independent variables separately as well as their combined effects of the independent and interactive effects (Onwioduokit, 2000). A symbolic representation of the design is shown below:

E_1	O_1	X_1	O_2	O_3
E_2	O_4	X_2	O_5	O_6

Where: E_1 = Experimental group 1(taught using non digital game-based learning strategy)
E_2 = Experimental group 2 (taught using computer simulation strategy)
$O_{1,4}$ = Pre-test measurements
$O_{2,5}$ = Post-test measurements
$O_{3,6}$ = Retention measurements
X_1 = Treatment for group one
X_2 = Treatment for group two

The design also controlled the inner legitimacy dangers of the underlying gathering proportionality and the exploration predisposition since there is no randomization of the subjects into gatherings. As a result, the intact classes were already arranged. The seating arrangement and classroom schedules to accommodate the study were not affected in any way by this.

Sample and Sampling Techniques

The sample consisted of 122 Senior Secondary School Chemistry students chosen using multistage sampling procedure. Each of the Local Government Areas in the Zone was considered a stratum. From the seven local government areas existing in the research area, two local government areas were chosen by the hat and draw techniques involving ballot method. Using

the same method two schools were chosen from two selected LGAs with computer laboratories. The standard for the choice of the school is dependent on the basis that each school had presented students for the national school examination. (WAEC). The chemistry teachers must have had more than five years of cognate teaching experience and the school is co-educational, two intact SSI chemistry classes were respectively selected. This in effect means that all members of the intact classes used were considered as subjects and an intact class in each of these schools was assigned to each of the treatment groups.

The schools were not in close proximity to each other to avoid interaction between subjects of the groups. Apportioning of subjects to the experimental groups was not by randomization since intact classes were used.

Instrumentation

A researcher-made instrument tagged: Chemical Bonding Achievement Test (CBAT), a 50 items multiple-choice test with four response options drawn from the concept of chemical bonding was used for data collection. The CBAT was used for pre-test, post-test, and retention measurement. The post-test and retention tests were reshuffled versions of the CBAT arranged differently in serial numbering and response options.

Validation of the Instrument

The extent to which an instrument measures what it purports to measure is its validity. It supports the generalization of findings to the entire population by allowing for representativeness (Amajuoyi and Joseph, 2016). Face validity and content validity were guaranteed in this study. The term "face validity" refers to the test's outward appearance and aims to demonstrate whether the test items took into account the test language and each student's level of comprehension. According to Joshua (2009), content validity, on the other hand, is the extent to which test items adequately represent or cover the content that the test is designed to measure. To ensure that the items were appropriate, experts in test construction, measurement, and evaluation ensured the instrument's face validity. The items were then given to two secondary school Chemistry teachers for review, and the final instrument incorporated their various inputs to ensure content validity. To help the researcher select the items for the 50-item chemical bonding test, a table of specifications (test blueprint) was created; this was done to make sure that all of the behavioral domains that were going to be measured were adequately covered by the test items.

Reliability of the Instrument

The degree to which an instrument consistently evaluates what it was designed to evaluate is its reliability. A preliminary testing was finished to decide the unwavering quality of the instrument utilizing the split-half type of reliability. The instrument was given to SS1 students from a school that was not chosen for the study. A reliability coefficient of 0.72 was obtained through this procedure. This gauge was viewed as sufficient in light of the fact that Joshua (2009) opined that an unwavering quality coefficient of 0.50 or more is great and sufficiently high to legitimize the use of an instrument; hence the gauge got was sufficiently high to legitimize the utilization of the instrument for research purposes.

Experimental Procedure

After choosing the schools, the researcher went to those schools, asked the principals for permission to use their schools for the study, and asked the SS1 Chemistry teachers to help out as research assistants. This was trailed by an irregular determination of unblemished classes from

among the different arms of SS1 students in the chose schools. After that, experimental groups one and two were assigned to each class. Instruction on how to use the researcher's validated lesson notes was given to the three chosen teachers of chemistry. The non-digital game-based strategy was used to teach the students in Group 1. The game consisted of a four-sided dice with the chemical symbols and valency of various metals and non-metals written on each side. Each student was given two dice and instructed to roll them, resulting in a variety of chemical combinations from which they could deduce the chemical formula and bond type of the resulting compound, as depicted in figure 1. Group 2 students received instruction through computer simulation. The Chemical Bonding Achievement Test (CBAT) was given to all groups prior to treatment as a pre-test by the research assistants following the briefing. The research assistants then taught the chemical bonding concepts for four weeks using the treatment package. The Chemical Bonding Achievement Test (CBAT) was rearranged and given to both groups as a post-test at the conclusion of the classroom instruction. The students in each group were compared using this baseline data. To avoid disrupting the school program, all of the groups were taught during the regular Chemistry class periods in an intact classroom setting. The Chemical Bonding Achievement Test (CBAT) was rearranged and administered once more as a retention test three weeks after the post-test. The research assistants immediately collected the test scripts from the pre-test, post-test, and retention tests at the conclusion of each test and gave them to the researcher for scoring and analysis.

Figure 1

Figure 2

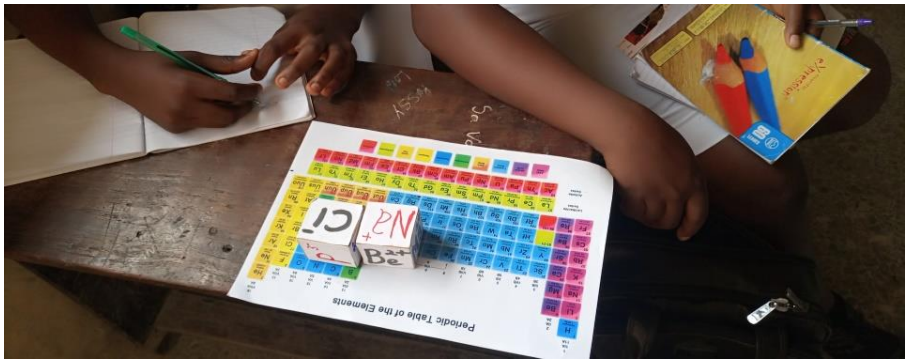

Figure 3

Figure 4

Figure5

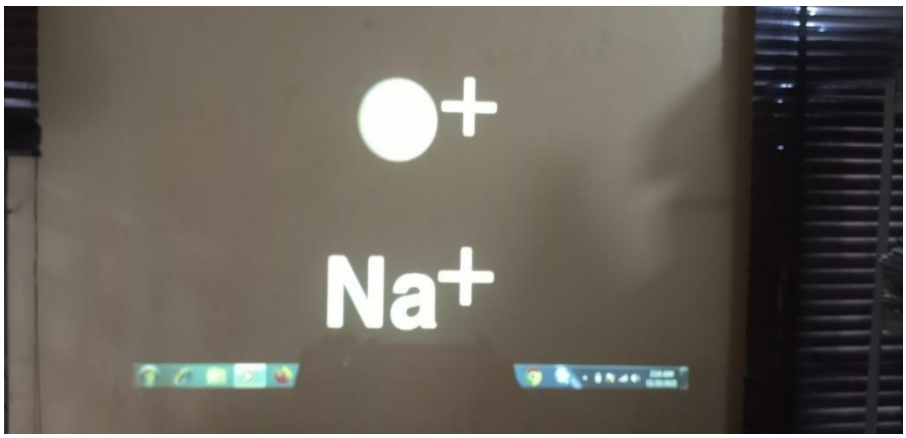

Figure 6

Figure 7

Scoring of the Instrument

Each correct answer on the achievement test scored 2 marks while wrong answers scored zero. The total mark earned is 100 marks while the minimum mark was zero.

Data Analysis

Mean, Standard Deviation, and Analysis of Covariance (ANCOVA) statistics were used to analyze the pre-test, post-test, and retention test data at a significance level of 0.05. Since subjects could not be randomly assigned to groups, ANCOVA was used to equate the initial difference between the groups to test the effect of the treatment.

RESULTS

Research Question 1:

Table 1: Classification of learners' pre- and post-test scores according to treatment groups' mean and standard deviation Treatment Groups

Treatment Groups	N	Pre-test		Post-test		Mean Gain Score
		$\bar{X}$	SD	$\bar{X}$	SD	
NDGBL strategy	60	16.23	5.98	38.13	4.77	21.90
Simulation	62	15.29	4.19	36.82	3.73	21.53

Source: Field Data (2023)

The pre-test and post-test mean scores and standard deviations of learners taught with NDGBL strategy and Computer Simulation are displayed in Table .1. Those who were instructed using Game-based Learning had a higher mean gain score, as evidenced by the 21.90 and 21.53 mean score differences between the pre-test and post-test scores. However, the students in the NDGBL and Computer Simulation class post-test had a standard deviation score of 4.77 and 3.73 indicating that the Simulation group had the closest scattering of raw scores relative to the group mean, while the NDGBL group had the largest scattering. Expectedly the two gatherings had post-test mean scores that were higher than their pre-test mean scores.

Hypothesis One:

Table 2: Analysis of Covariance (ANCOVA) of students' post-test scores ordered by treatment groups with pre-test scores as a covariate

Source	Type III Sum of Squares	Df	Mean Square	F	Sig.	Decision at p<.05 alpha
Corrected Model	268.84[a]	2	134.42	8.10	.001	S
Intercept	12886.17	1	12886.17	776.23	.000	S
Pretest	216.45	1	216.45	13.04	.000	S
Treatment	34.27	1	34.27	2.06	.153	Ns
Error	1975.53	119	16.60	-	-	-
Total	173507.00	122	-	-	-	-
Corrected Total	2244.37	121	-	-	-	-
a. R Squared = .120 (Adjusted R Squared = .105)						

Source: Field Data (2023)

The calculated F-ratio and associated calculated level of significance for the impact of instructional methods at (df 1, 119) are shown in Table 2. The decision is based on this level of significance, which is greater than.05; showed that there was no significant difference between the mean performance scores of learners instructed on the concept of chemical bonding with computer simulation and NDGBL. Null hypothesis one is upheld. The implication is that the accomplishments of the two groups were comparable.

Research Question 2:

Table 3: Pre-test and post-test mean and standard deviation of learners' pre- and post-test scores by treatment group and gender Treatment Groups

Treatment Groups	Gender	N	Pre-test		Post-test		Mean Gain Score
			$\bar{X}$	sd	$\bar{X}$	sd	
NDGBL Strategy	Boys	32	16.25	6.24	38.34	4.22	22.09
	Girls	28	16.21	5.77	37.89	5.41	21.68
Simulated instruction	Boys	32	15.41	3.78	37.19	3.70	21.78
	Girls	30	15.17	4.65	36.43	3.79	21.26

Source: Field Data (2023)

Table 3 displays the mean scores before and after the test; and the standard deviation of the scores of boys and girls who were instructed on the concept of chemical bonding through computer simulation and NDGBL. Boys and girls in the Game-based class have mean gain scores of 22.09 and 21.68, respectively. This observation demonstrates that male participants achieved better than females in this group. Boys and girls in the Computer Simulation class have mean gain scores of 21.78 and 21.26, respectively. This observation demonstrates that males also performed better than females in this group. The perceptions regarding the two scores show that the male students showed utilizing the NDGBL model had higher mean addition scores (22.09) altogether, trailed by their male partners in the Virtual simulation group (21.78). The dispersing of the post-test raw scores and the post-test mean was the broadest female learners in the NDGBL strategy.

Hypothesis Two:

Table 4: Summary of ANCOVA of boys and girl's post-test scores classified by treatment class and gender with pre-test scores as a covariate

Source	Type III Sum of Squares	Df	Mean Square	F	Sig.	Decision at p<.05 alpha
Corrected Model	279.16[a]	4	69.79	4.16	.003	S
Intercept	12883.92	1	12883.92	767.05	.000	S
Pretest	214.93	1	214.93	12.80	.001	S
Treatment	34.00	1	34.00	2.02	.157	Ns
Gender	9.76	1	9.76	.58	.447	Ns
Treatment * Gender	.48	1	.48	.03	.867	Ns
Error	1965.21	117	16.80	-	-	-
Total	173507.00	122	-	-	-	-
Corrected Total	2244.37	121	-	-	-	-
a. R Squared = .124 (Adjusted R Squared = .094)						

Source: Field Data (2023)

The calculated F-ratio and corresponding calculated level of significance for the primary effect of gender on the student's performance at df 1,117 as shown in Table 4. The decision is based on this level of significance, which is greater than.05; indicating that, given the instructional methods used, there was no significant difference in the concepts taught between boys and girls learners' academic performance. This observation supported null hypothesis 2.

Research Question 3:

Table 5: Mean and standard deviation of students' post-test and retention scores classified by treatment groups

Treatment Groups	N	Post-test		Retention		Mean Score difference
		$\bar{X}$	sd	$\bar{X}$	sd	
NDGBL	60	38.13	4.77	37.03	4.31	-1.10
Computer Simulation	62	36.82	3.73	35.31	3.50	-1.51

Source: Author's Field Data (2023)

Table 5 indicated the post-test and retention mean score and the standard deviation of scores of the learners instructed with, NDGBL and Simulated instruction. The retention - post-test mean scores' differences of -1.10 and -1.55, respectively, NDGBL.and Simulated groups indicated that those in NDGBL retained the concepts better than those in simulated environment as they had lower memory decay. The negative sign indicates memory decay. The retention standard deviation scores of 4.31and 3.50 for students in NDGBL and Simulation groups, indicating that the scattering of raw scores about the group means, was closest in Computer Simulation group. The two groups' mean retention scores were expected to be lower than their mean post-test scores. The results of the testing of hypothesis three, which are presented in Table 6, determine whether the observed difference in the mean scores of the groups was statistically significant

Hypothesis Three:

Table 6: Post-test scores were used as a covariate in the Summary of Analysis of Covariance (ANCOVA) of students' retention scores divided into treatment groups

Source	Type III Sum of Squares	Df	Mean Square	F	Sig.	Decision at p<.05 alpha
Corrected Model	1660.93[a]	2	830.47	361.85	.000	S
Intercept	30.54	1	30.54	13.31	.000	S
Posttest	1570.00	1	1570.00	684.08	.000	S
Treatment	11.36	1	11.36	4.95	.028	S
Error	273.11	119	2.30	-	-	-
Total	161417.00	122	-	-	-	-
Corrected Total	1934.04	121	-	-	-	-
a. R Squared = .859 (Adjusted R Squared = .856)						

Source: Author's Field Data (2023)

The calculated F-ratio and corresponding calculated level of significance for the effect of instructional strategies on student retention at (df 1, 119) are shown in Table 6. This degree of importance is under to.05 in which the choice is based; indicating that students' retention of NDGBL-taught concepts was significantly different from that of computer simulation-taught concepts. The rejection of null hypothesis 3 was based on this observation. The mean scores in Table 6 shows the importance was supportive of students in NDGBL group

DISCUSSION OF FINDINGS

From the outcomes, the accompanying perceptions were made:

1. Students' scores on the concepts taught using the NDGBL and Computer Simulation strategies were not significantly different in terms of academic achievement.
2. Given the instructional methods used, there was no statistically significant difference in student academic achievement based on gender.
3. There was a tremendous contrast in the retention of student on utilizing NDGBL and Virtual experience methodology. The importance was supportive of students in NDGBL group.

There was no statistically significant difference in the academic achievement of students taught chemical bonding using NDGBL and computer simulation instructional strategies, as demonstrated by the findings on the effectiveness of NDGBL and Computer Simulation strategy. This suggests that the two approaches are comparable, and the fact that students in the NDGBL and Computer Simulation groups perform better is attributed to the fact that the two approaches are both student-centered. This means that students participate in activities that stimulate their cognitive abilities and promote deep learning while the teacher serves as a facilitator of instruction. Balakrishna (2023), Yeboah et al. (2023), Chong et al. (2022), Hamid et al. (2022), Alhadlaq (2023), Uzezi and Deya (2020), Chemba et al. (2023) all come to the same conclusion on the effectiveness NDGBL and computer-simulated strategies in comparison to the explanatory strategy. This could be on the grounds that game players routinely show constancy, regard for point by point and critical thinking ways of behaving which are appropriate for compelling learning, additionally the utilization of game permits players to be off-base without pressure on unfortunate results outcome, prompting individualized discovering that supports commitment in decisive reasoning, collaboration and imaginative critical abilities to think. The fundamental components of game-based learning and computer simulation are embedded learning within

activity context, authentic contexts, settings, and situations that typically involve social interaction and collaboration.

It was discovered that, given the instructional methods used, students' academic achievement was not significantly influenced by gender with regard to the impact of gender on student achievement. This is in consonance with the investigations of Lasisi et al.(2021), Alvarez-Herreo and Valls-Bautista (2021), Alake and Olojo(2020), Nkemakolam et al(2018) and Nja et al.(2017), who saw that students' mean scores when educated with NDGBL and reenactment educational systems didn't essentially vary by orientation when sexually unbiased educational procedures are utilized in the instructing and learning of science, these discoveries recommend that young men and young ladies have made equivalent progress in the subject.

On the impacts of NDGBL and Virtual experience on student retention the discoveries displayed there was a tremendous distinction in the retention score of students in utilizing NDGBL and Programmatic experience. The mean scores in Table 6 show the importance was agreeable to students in NDGBL class. This observation could be due to the fact that NDGBL provides space for students to increase engagement through effective collaboration and communication, which increases interest and concentration, and it makes it possible for meaningful interactions with the learning environment, hence easy recall of the learned concept. This is consistent with the findings of Futokun et al. (2016), Nkok (2021) and Naderi and Moatian (2023) NDGBL were also found to have a significant impact on the retention of Chemistry concepts by students. This suggests that students' retention capacities could improve assuming science educators' utilized methodologies that would upgrade successful absorption of data towards significant review and recovery when the need emerges.

CONCLUSION

In view of the after effect of this review, it tends to be summed up those students prevail in science when they learn through game-based and programmatic experience guidance. In a classroom where orientation-predisposition-free instructional methods are utilized, orientation also has no measurable impact on student achievement, demonstrating that game-based and simulated strategy is an all-encompassing method that improves students' commitment to their education and classroom cooperation. It has been suggested that student-centered, active, and cooperative learning methods have helped students comprehend what it means to learn chemistry. Subsequently, learners will pay more attention to the lessons because game-based learning is one of the more innovative and entertaining approaches. This is because students are naturally good at playing games and educational games may inspire learners to enjoy the learning process, approach challenges with confidence, patience, and focus all of which are essential for the advancement of lifelong learners. It is important to note that educators should give attention to how games impact students' actions, emotionality, and cognitive ability which are the three most important aspects of educational process.

CONTRIBUTION TO KNOWLEDGE

The research finding serves as empirical evidence to the efficacy NDGBL despite the advent of digital technology. The additional worth of this study lies in not overlooking NDGBL having discovered that both instructional strategies improved academic performance of student with NDGBL being better in the retention of learned concept. There is also evidence that educational games and interactive learning environment improves student interest and concentration due to its impact on cognitive abilities, affective skills and the emotional and social states of the student.

In addition, developing nations like Nigeria with low budget allocation on education having few or no access to educational technologies can rely on innovative instructional strategies like NDGBL for improving academic achievement and retention in chemistry and other related science subjects.

ETHICAL ISSUES

The researcher visited the four schools selected for the study, sought the cooperation of the SS1 Chemistry teachers as research assistants, and obtained permission from the principals to use their schools for the research. The respondents were encouraged to freely participate in the research without the researcher's influence and their privacy was also respected. In the course of the research work, the procedure for gathering data did not cause any physical or emotional harm to the respondents as the researcher did not conceal any information from them. The research work is void of plagiarism, doctoring of data, and distortion of the outcome of the research result.
Limitations of the Study

One of the key limitations experienced in this study was interruption in electricity supply during simulated instruction. However, this challenge was easily overcome with the provision of external backup power supply through the use of generator which provided uninterrupted power supply for effective learning experience. The study was also limited to selected secondary schools with computer laboratories due to the nature of the study.

RECOMMENDATIONS

1. Chemistry instructors ought to make effective use of computer simulation and NDGBL when instructing chemical bonding due to their enhancing effects
2. Regular workshops on how to use computer simulation and NDGBL to teach chemistry concepts should be organized by teachers of chemistry and professional organizations like Science Teachers Association of Nigeria (STAN) in conjunction with the school administration.

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APPENDIX

CHEMICAL BONDING ACHIEVEMENT TEST (CBAT)

Part A
Tick the appropriate column

Gender: Male ( ) Female ( )

Name of School: .....

Part B
Instruction: Answer all questions, circle only the correct option from the list of options provided.

1. The atom of an element X is represented as ${}^{y}_{z}X$. the basic chemical properties of X depend on the value of?
   A . Y B. Z C. Y-Z D. Z-Y.

2. The atom and ion of sodium have the same?
   A. chemical properties B. electrical charge C. electronic configuration D. number of protons

3. State the atomic number an element T whose cation T^{2+} contains 10 electrons
   A. 12 B. 25 C. 10 D.13

4. If the mass number of X is 24 and X^{2+} contains 10 electrons, the nucleus of X will consist of
   A. 8 protons and 16 neutrons
   B. 10 protons and 15 neutrons
   C. 10 protons and 12 neutrons
   D. 12 protons and 12 neutrons

5. The ions X^- and Y^- are isoelectric, each containing a total of 10 electrons, how many protons are in the nuclei of the neutral atoms of X and Y respectively?
   A.10 and 10
   B.9 and 9
   C. 11 and 9
   D. 9 and 11

6. An element X in group II forms an ionic compound with element N in group V in the periodic table. What is the formula of the compound?
   A. X_2N_5 B. X_2N_3 C. X_5N_2 D. X_3N_2

7. An element X with the electronic configuration $1S^22S^22P^63S^2$ combines with another element Y with the configuration $1S^22S^22P^63S^23P^5$. What is the formula of the compound formed?
   A. X_2Y_5 B.X_2Y_3 C. XY_3 D. XY_2

8. The atom X has six electrons in its outermost shell, what is the formula of the compound formed when X combines with aluminum ($_{13}$ Al)
   A. AlX_2 B. Al_2X C. Al_3X_2 D. Al_2X_3

9. If the atomic number of an element X is 11 and that of nitrogen is 7, the most likely formula of the nitride of X is ?
   A. X_3N B. XN_3 C. X_3N_2 D. N_2X

10. Two elements X and Y combine to form a compound with the formula X_2Y_3 which of the following representation would fit the electronic configuration of X and Y?
    A. X Y B. X Y C. X Y D. X Y
    2,2 2,3 2,6 2,5 2,8,2 2,8,3 2,8,3 2,6

11. Which of the following statement is correct about sodium chloride in the solid-state?
    A. It exists as aggregates of ions

B. It conducts electricity
C. Its melting point is below 100°C
D. It exists as discrete molecules

12. The bond between H_2O and H^+ to form hydroxonium ion H_3O^+ is
A. covalent B. dative C. electrovalent D. ionic

13. Which of the following statement about dative bonding is not correct?
A There is sharing of electrons
B One atom must possess a lone pair of electron
C Each participating atom contributes one electron
D It can be formed between molecules

14 The electronic configuration of carbon atom in its excited state is [$_6C$]?
A $1s^2\ 2s^2\ 2px^1 2py^1$
B. $1s^2\ 2s^2\ 2px^2 2py^0$
C. $1s^1\ 2s^2\ 2px^1 2py^1\ 2pz^1$
D. $1s^2\ 2s^1\ 2px^1 2py^1\ 2pz^1$

15. Which of the following species does not contain a coordinate bond?
A. Al_2Cl_6 B. CCl_4 C. H_3O^+ D. NH_4^+

16 If the difference between the electronegativities of two elements is large, the type of bond that can be formed between them is?
A. Covalent B. Dative C. Ionic D. metallic

17 In which of the following crystals are the particles held by van der Waal's forces only
A. Sodium chloride B. Ice C. Diamond D. Iodine

18 Which of the following compound has hydrogen bonds between it molecule?
A. HF B. HBr C. HCl D. HI

19. The electronic configuration $1s^2 2s^2 2p^6 3s^2 3p^6$
A. Noble gas
B. Group II element
C. Group III element
D. Group IV element

20. Which of the following does not have the electronic configuration of $_{18}Ar$?
A. Al^{3+} B. Ca^{2+} C. Cl^- D. K^+

21. Which of the following species correctly represent an ion of M with 13 protons and 10 electrons?
A. $_{10}M^{3+}$ B. $_{10}M^{3-}$ C. $_{13}M^{3+}$ D. $_{13}M^{3-}$

22 How many principal electronic shells has an atom whose electronic configuration is shown below $1S^2 2S^2 2P^6 3S^1$ A. 1 B. 2 C. 3 D. 4

23. Which of the following properties is not characteristic of an electrovalent compound?
A. Formation of crystalline solids
B. Solubility in a polar solvent
C. High vapor pressure D. High melting and boiling point

24. In which of the following crystals are the particles held by van der Waals forces only
A. Sodium chlorine B. Ice C. Diamond D Iodine

25. Two elements X and Y are in the same group on the periodic table because they both have the same?
A. number of electronic shells

B. number of valence electrons
C. atomic size
D. atomic number

26. The energy required to remove the most loosely bound electron from an atom in the gaseous state is known as the? A. bond energy B. ionization energy
C. potential energy D. activation energy

27. The maximum number of quantum number of electrons that can be accommodated in the shell having the principal quantum number 3
A. 3 B. 9 C. 10 D. 18

28. Which of the following is correct about the electrons in the 1S orbital?
A. Have the same spin
B. Are easier to remove than those in the 2p orbital
C. Are closest to the nucleus
D. Have the same energy as those in the 2S orbital

29. The following compound contains the same type of bond except?
A. Sodium Chloride
B. Hydrogen chloride
C. Magnesium chloride
D. Potassium chloride

30 Rare gases are stable because they?
A. Are chemically active
B. Contain equal number of protons and neutrons
C. Contains more electrons than protons
D. Have octet structure

31. If a solid has a low melting point and dissolves readily in benzene, it would probably?
A. Contain strong electrostatic forces of attraction
B. Conduct electricity in the molten state
C. Dissolve in water
D. Have covalent bonding

32. When an atom gains an electron, it becomes?
A. complex ion B. negatively charged C. oxidized D. a cation

33. The mass number of an atom of an element is the sum of its?
A. Electrons, neutrons and protons
B. Electrons and protons
C. Protons and neutrons
D. Orbital electrons

34. How many unpaired electrons are there in an atom of an element with the following electronic configuration? $1S^2 2S^2 2P^6$
A. 0
B. 1
C. 2
D. 6

35. The bonds in crystalline ammonium chloride are?
A. covalent and dative
B. ionic and covalent
C. ionic covalent and dative
D. ionic, covalent and hydrogen bond

36. An atom with 17 protons, 17 electrons, and 18 neutrons has a mass number of?
A. 17 B. 18 C. 34 D .35

37. Hydrogen bonds are formed between molecules containing a hydrogen atom bonded to a?
A. Strongly electronegative atom
B. Non-polar species
C. Diatomic element
D. Complex ion

38. The Van der Waals forces are dominant intermolecular forces in?
A. Ammonium chloride
B. chlorine
C. sodium chloride
D. water

39. A substance which dissolves readily in organic solvent would?
A. Be a covalent compound
B. Have strong electrostatic forces of attraction
C. Have high melting point
D. Conduct electricity in molten state

40. How many unpaired electrons are there in an atom of an element with the following electronic configuration?$1s^2 2s^2 2p6$
A. 0
B. 1
C. 2
D. 6

41. The major reason why chemical reaction occurs among elements is that they have the tendency to?
A. Attain the nearest noble gas structure
B. Became a metal
C. Become a non -metal
D. Become any noble element

42. An atom X consists of 6 protons, 6 electrons and 7 neutrons. Which of the following represent the correct atom?
A. $_6{}^{13}X$
B. $_7{}^{13}X$
C. X
D. $_7{}^{19}X$

43. Chlorine atom forms chloride ion Cl^- by
A. losing one electron
B. sharing one electron
C. donating one pair of electron
D. gaining one electron

44. An element belongs to a period in the periodic table because of?
A. The number of electrons in its outermost shell
B. The shell number
C. The size of the atom D. The electronic configuration in the azimuthal quantum number

45. Which of the following determines the chemical properties of an atom?
A. Electron
B. Neutron
C. Nucleus
D. Proton

46. Pauli exclusion principle is related to?
    A. Quantum numbers of electrons
    B. Reversibility of equilibrium reactions
    C. Electronegativity values of elements
    D. Collision theory of reaction rates

47. Which of the following substances is non-polar?
    A Br_2
    B. NF_2
    C. H_2O
    D. HBr

48. Which of the orbitals 4S, 4P, 4d, and 4f has the lowest energy?
    A. 4f B. 4P C. 4d D. 4S

49. Electrostatic force of attraction between sodium ion and halide ion is greatest in?
    A. NaCl
    B. NaBr
    C. NaF
    D. NaI

50. What is responsible for metallic bonding?
    A. Sharing of electrons between the metal atoms
    B. The attraction between the atomic nuclei and cloud of electrons
    C. Transfer of electrons from one atom to another
    D. The attraction between the negative ions

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Nexus Between Dividend Pay-Out and Financial Performance of Registered Microfinance Companies in Tanzania

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Abstract:
The majority of scholars and researchers worldwide are interested on the financial performance of entities, whether financial or non-financial. The primary goal of this study is to look at the effect of dividend distribution on the financial performance of Tanzanian registered SACCOS. In this study, a quantitative research approach and a time series research design were used. The research population comprised economic data from 2006 through 2020. This research was based on 143 observations (Annual financial data) collected from a reliable source (Bank of Tanzania). According to the study's findings, dividend distribution is positively related to financial performance. According to the study, managers should pay attention to the "macroeconomic environment in which these organizations were operating" since it was crucial to determining their success and, as a result, their greater financial performance.

Keywords: Dividend Pay-Out, Financial Performance, SACCOs, Tanzania

INTRODUCTION

The bulk of scholars and researchers across the world are concerned with the financial performance of institutions, whether financial or non-financial. Financial performance is concerned with how well businesses use their resources, including financial and non-financial, to earn money (Harahap, Septiani, & Endri, 2020). Financial performance has been a subject of concern for all firms worldwide since failing to perform in a competitive business means losing one's competitive edge and collapsing (Mbaka, 2018).

Many criteria are used to analyze an entity's performance in order to categorize it as performing well. According to Barbuta-Misu (2019), the bulk of research has used Return on Equity (ROE), Return on Assets (ROA), and Return on Sales (ROS) to measure the success of firms. In his study, Miriti (2014) analyzed the financial performance of organizations using profitability, liquidity, growth, and expansion.

Furthermore, in his research, Mokua (2015) considered profitability and dividend pay-out as metrics of an entity's financial success. It is vital to determine the financial performance of registered SACCOS since monitoring the financial performance of organizations is crucial. In 1849, poor people in Germany formed SACCOS to resist the misuse of money lenders (ACIST, 2003). SACCOS were first used in agricultural production regions in the 1920s as Rotational Savings and Credit Associations (ROSCA) (Kiwelu, 2016). Reiffesian and Schuze Delitzsech, two Germans, created an interest by assembling people for self-help goals, and Raiffesian made it his business to work out the plant to support small farmers who were unable to progress owing to a lack of credit facilities (Mbagga, 2013).

SACCOS in Africa may be traced back to the pioneer Revered John Mac Nutty, who organized a group among his parishioners before transforming the organization into a SACCOS in September 1955 (Mbagga, 2013). Microfinance institutions in African countries serve the bulk of the poor. Because the majority of Africa's poor have limited access to deposit and credit facilities, as well as other financial services provided by established financial institutions, this is the case. In Ghana, for example, just around 6% of the poor have access to the financial system. The remaining poor rely on microfinance institutions like SACCOS for deposits and credit.

Despite SACCOS' crucial function in providing savings and credit to the poor, its financial performance is critical in order for it to serve its members, pay taxes, and continue to exist. In a study conducted in Kenya, Odhiambo (2019) discovered that membership savings, service costs, members' income, employee competency and credentials are all factors impacting SACCO financial performance. Mmari and Thinyane (2019) conducted study in Lesotho and discovered that SACCO financial performance is influenced by member ratios, capital, loan delinquency, savings volumes, and total SACCO asset growth.

In Uganda, Kule, Kamukama, and Kijjambu (2020) discovered that a good credit score It has been highlighted that SACCOS, as one of the micro-finance organizations, were founded to serve the excluded people who were thought to be untrustworthy by financial institutions such as banks.

As a result, SACCOS institutions emerged as solutions to ensure that even the poor may bank, earn interest, and save continually (Abate, Borzaga, & Getnet, 2013). As a result, the financial success of SACCOS is critical in order to serve its members properly. Currently, SACCOS performance varies owing to varied operational methods and groupings of SACCOS that SACCOS is whether group A or group B (Cooperative Registrar, 2021). However, because SACCOS serve the majority of Tanzanians, the Tanzanian government has been assisting them by ensuring they function in accordance with the law.

Despite SACCOS' significant role as an alternative financial remedy for the poor through their savings, some factors cause SACCOS to fail to achieve its financial objectives, including members' contributions, member size, inability to use entrepreneurial skills to manage SACCOS, delay in returns of loans by members, interest rates, and poor dividend payments (Renatus, 2019; Ndiege, Mataba, Msonganzila, & Nzilano, 2016; Magali, 2013).

Several academics and researchers, including (Danga & Yusuph, 2019; Renatus, 2019; Mohamed, 2018; Mwizarubi, Kumar,Mnzava & Prusty, 2016; Kengia, 2015), have taken the time to identify elements that impact the financial success of SACCOS in Tanzania. However, most research on the effect of registered SACCOS on financial performance do not explicitly address issues such as capital sufficiency, membership size, liquidity, and dividend pay-out. Furthermore, the studies are not sufficiently related to financial success. As a result, there is a need to investigate the impact of these variables on the financial performance of registered SACCOS.

The purpose of this study was to identify factors influencing the financial performance of registered SACCOS, with a focus on determining the influence of capital adequacy, membership size, liquidity, and dividend pay-out of five SACCOS located in Dodoma City on the financial performance of registered SACCOS from 2006 to 2020, and to assess how well these variables

influence the financial performance of registered SACCOS. Because of the rapid increase in population from 410,956 to 601,609, as well as the movement of government operations from Dar es Salaam to Dodoma, this study was conducted in Dodoma. Oigo (2015), on the other hand, determined the capital adequacy, asset quality, management capacity, and earning quality using a variety of criteria.

Tanzanian microfinance started in the 1990s, when the government launched financial sector reforms to establish a more effective and stable financial system. The country's financial sector reforms aimed to provide access to financial services for low-income citizens and improve their social and economic well-being (Bikk & Joseliti, 2003).

The Cooperative Societies Act of 2013 was enacted in 2013 to make cooperatives more legal and effective. Furthermore, procedures for granting licenses to SACCOS operating in Tanzania were introduced in 2020. According to the guidelines, SACCOS are divided into two groups: those with a capital of less than $10 million (Group A) and those with a capital of more than $200 million (Group B) (Registrar of Cooperative Societies, 2020). These SACCOS are classified as follows:

According to the Hazina SACCOS report (2021), the SACCOS had enrolled 500 new members by the end of 2021 and had 6700 members. This indicates an increase in the number of members. Other SACCOS, such as Mkombozi Soko Kuu SACCOS in Kondoa, have been losing members, and member contributions have been low, negatively affecting the organization's financial performance.

The rise in the number of SACCOS members leads to an increase in contributions, which affects the SACCOS's capital structure (Renatus, 2019). If the SACCOS's membership and donations expand, the board of directors may decide to pay a dividend to its members at the annual general meeting if the SACCOS does well financially.

According to Gikuri and Sanka (2018), the level of savings of SACCOS members has a considerable influence on lending. SACCOS members may take loans by giving assets such as bonds or securities, which will be referred to as liquidity if a member fails to pay their dues.

This ensures that the money granted by SACCOS as a loan to a member is not squandered. Several studies in Tanzania have been conducted on factors influencing the financial success of SACCOs (Renatus, 2019; Said, Annuar, & Hamdan, 2019; Mohamed, 2018), employing several variables to measure financial performance. These studies, however, have not sufficiently investigated how factors such as dividend distribution impact the financial success of Microfinance Companies in Tanzania.

LITERATURE REVIEW

Miller and Modigliani (1961) created the Dividend Irrelevance Theory. According to this argument, dividends do not appear to increase a company's prospective profitability or stock price. Dividend payments do not determine the worth of a firm. They also demonstrate that in a perfect capital market, a firm's optimal investment decisions are unaffected by how they are financed (Jain & Rastogi, 2020).

Previous studies, such as Priya and Mohanasundari (2016) and Jain and Rastogi (2020), have used this hypothesis to determine the influence of profitability on dividend distribution. Several assumptions have been created by the theory, including: i) the absence of taxes; and ii) when a business issue shares, there are no flotation charges or transactions. iii) when the company determines its capital budgeting and dividend policy.

Shibutse, Kalunde, and Achoki (2019) evaluated the influence of liquidity and dividend distribution on the financial performance of deposit-taking SACCOS. From 2013 to 2017, the researchers utilized a mixed technique approach to collect primary and secondary data from 174 deposit-taking savings (DPS) and credit cooperative societies (CCS). Descriptive statistics and regression models were used to analyze the data. The findings demonstrated that dividend distribution plays an important role in DPS and CCS's financial performance, supporting in the management of the institution's assets and liabilities, as well as ensuring optimal liquidity and cash flow management. Koduk (2016) investigated the relationship between SACCOS financial performance and dividend distribution. In 2011, the study relied on secondary data from 164 SACCOS.

Mohamed (2018) researched the elements influencing the financial performance of Majengo Sokoni SACCOS in Dodoma once again.

A cross-sectional design was used in the investigation. For analysis, descriptive statistics and multiple regression models were utilized. The study's findings demonstrated that dividend payout had a considerable beneficial effect on ROA and ROE. As a result, dividend payments have a substantial impact on SACCOS's future profitability and are likely to attract new members.

Malua (2013) conducted research on the financial performance and sustainability of microfinance organizations in Tanzania. The study included 15 SACCOS in Mtwara Municipal. Data was gathered through a questionnaire, document examination, and an interview. According to the conclusions of the survey, 73% of SACCOS do not pay dividends.

RESEARCH METHODOLOGY

A quantitative research technique and a time series research design were employed in this investigation. Financial data from 2006 to 2020 were included in the research population.

This study was founded on 143 observations (annual financial data) obtained from reputable sources such as the Bank of Tanzania (BOT). To choose registered SACCOS in Dodoma, the purposive sampling approach was utilized. The fixed effect model was employed to meet the study's specific goal of demonstrating the relationship between a dependent variable and independent factors.

Therefore, the fixed effect model is described as follows;

$$\boldsymbol{y_{it} = \beta_1 DP_{it} + a_i + u_{it}} \quad \text{..... (1)}$$

Whereby;

$\boldsymbol{y_{it}}$= Return on Asset (ROA)

DP_{it} = Dividend Payout

$\boldsymbol{u_{it}}$= error term associated with companies and time
a_i = unobserved fixed effect
t = 2006, ..., 2020.

RESULTS AND DISCUSSION

Between 2006 and 2020, secondary data was obtained from the audited financial reports of (13) Registered SACCOS. The ratios of the primary SACCOs financial performance indicators (dividend pay-out and ROA) were gathered and evaluated to answer research questions.

Figure 4.1:Time Series Plot for Registered SACCOS in Dodoma City, Tanzania
Source: STATA, 2023

Before estimating, time series data should be shown to find different qualities or characteristics such as trend, seasonality, and stationarity (Wagofya, 2019). Both variables were stationary, as shown in Figure 4.1, since they varied around a steady mean and showed fluctuation in capital, dividend pay-out, and ROA over time.

Descriptive Analysis

A preliminary summary statistics analysis, as well as pair-wise correlation, were presented. It was utilized to identify the most important features of the study results and gave concise descriptions of the sample and measurements used in the analysis, as well as a graphical presentation that was easy to grasp.

Table 4.1: Descriptive Statistics

Variable		Mean	Std. Dev.	Min	Max	Observations
ID	overall	6	2.17	1	11	N = 143
	between		1.31	1	11	n = 11
	within		0	6	6	T = 13
Year	overall	2014	2.75	2008	2020	N = 143
	between		0	2014	2014	n = 11
	within		1.75	2008	2020	T = 13
	within		0.09	-0.059	0.52	T = 13
DP	overall	0.65	0.14	0.33	1.36	N = 143
	between		0.11	0.40	0.79	n = 11
	within		0.10	0.42	1.21	T = 13

Source: Study Findings (2023)

Dividend Payout:

The term Dividend payout flexible in this study refers to the earnings per share ratio. The average dividend payout was 0.355639, with a high of 0.6808 and a minimum of 0.0059. The Dividend payout of the firms in this research did not differ significantly since the Dividend payout was 0. 161916.

Pair Wise Correlation:

A pair-wise correlation was done between capital adequacy, membership size, liquidity, and dividend pay out to explore how these elements were related. To determine correlation from a particular observation with missing values for numerous variables, the pair-wise correlation approach was utilized. Table 4.2 displays the pair-wise correlation value for each variable.

Table 4.2: Pairwise Correlations

Variables	(DP)	(L_DP)
DP	1.000	
L_DP	0.718***	1.000

Source: Study Findings (2023)

The pairwise correlation for the variable included in the model is shown in Table 4.2. It is one of the most often used approaches for detecting the presence of multicollinearity. Table 4.2 shows that capital adequacy has a positive relationship with Return on Assets (ROA), although a modest positive relationship with a p-value less than 0.05.

Diagnostic Test

Panel Unit Root Test:

It is advised to examine before estimating the fixed effect model and random effect model for panel data with more than 10 observations across time (Deb &Mukherjee, 2008). The Levin-Lin-Chu unit-root test, which includes the unadjusted t and adjusted t, is then used to determine the presence of the panel unit root. Table 4.3 shows that all of the variables in the models were stationary since the p-value for all variables was less than 0.05. This means that the normal fixed effect model, ordinary least square regression, and Random effect model were adequate for that panel data.

Table 4.3: Panel Unit Root Tests for the Variables at Level

Variable	Statistic	P-Value
Dividend Payout		
Unadjusted t	-5.7537	
Adjusted t*	-3.2872	0.0005
L_DP		
Unadjusted t	-6.2395	
Adjusted t*	-3.5762	0.0002

Source: Study Findings (2023)

Multicollinearity Test:

Kim (2019) defines multicollinearity as "a high degree of linear intercorrelation between explanatory variables in a multiple regression model that leads to incorrect regression results." The Variance Inflation Factor (VIF), as shown in Table 4.4, is one of the diagnostic tools for multicollinearity. Table 4.4 displays the results of the multicollinearity test, which was performed to see if one independent variable in the model influenced another. According to the rule of thumb, if the variance inflation factor is smaller than 10, there is no multicollinearity. As a result of the data in Table 4.4, the mean value for the variance inflation factor was 1.03, which is less than 10. This demonstrates that there is no multicollinearity. This indicates that the independent variables in the equation are

The pairwise has related dividend pay-out and SACCOS return on assets (ROA). This notion is backed by other researchers who claim to have discovered a link between dividend payout and financial success in SACCOS.

Table 4.4: Multicollinearity Test

Variable	**VIF**	**1/VIF**
L_DP	0.33	0.97105
Mean VIF	**1.03**	

Source: Study Findings (2023)

Normality Test:

The normality test was used to determine whether or not the data in this study had a normal distribution. In this study, which employed pooled panel data, the normality assumption had no effect on pooled panel regression. A skewness/Kurtosis test was used to verify normalcy. If the probability of the data is larger than 0.05, it is said to be consistently distributed.

Table 4.5: Skewness/Kurtosis Tests for Normality

Variable	**Obs**	**Pr(Skewness)**	**Pr(Kurtosis)**	**adj chi2(2)**	**Prob>chi2**
DP	150	0.5620	0.6320	3.20	0.3022
L_DP	150	0.2033	0.4560	2.30	0.3022

Source: Study Findings (2023)

H_0= Normality
H_1= non-normality

The normality assumption test, shown in Table 4.5, is used to assess whether the data are normally distributed or not before proceeding with the parametric estimating approach. Table 4.5 demonstrates that the null hypothesis was rejected for all variables since the p-value was greater than 0.05. This signifies that the variables utilized were regularly distributed, or that the distribution of all variables is normal.

Table 4.7: SA Test Model 2 (Dividend payout and Return on Assets)

Wooldridge test for autocorrelation in panel data
H0: no first-order autocorrelation
F (1, 4) = 0.346
Prob > F = 0.9193

Source: STATA Output (2022)

The autocorrelation problem, also known as serial correlation, is commonly encountered in time series data analysis. Serial correlation tests are used in pooled or panel data with long time series observations and short individuals. This isn't an issue with panel data (since there are so few years). When there is a serial correlation, the standard errors of the coefficients are smaller than they should be, and the R-squared is bigger. The results in Table 4.7 reveal that there is no serial correlation in the data since the P-value (0.9193) is larger than 0.05, which is the level of significance used in this investigation. This shows that at that level of significance, the null hypothesis is not rejected, implying that there is no first-order autocorrelation.

Heteroscedasticity:

The error term (it) created by variation between independent variables in the regression model can be utilized to identify heteroscedasticity. The need to test for heteroscedasticity stems from the fact that such error variables have varied variance, which can lead to inconsistent findings. When the constant error does not have a constant variance, i.e., var (it) =2, it leads in heteroscedasticity (Akiwande, Dikko, and Agboola, 2015). As a result, the Heteroscedasticity test is necessary in order to achieve consistency in findings and meaningful interpretations of results.To account for heteroskedasticity, a robust standard error estimate was developed.

Selection between Fixed Effect Model and Random Effect Model

Table 4.12: Breusch and Pagan Lagrangian Multiplier Test

Estimated results:	Var	sd
ROA	0.0669728	0.258791
E	0.0482890	0.219748
U	0	0
Var(u)=0		
Test:	chibar2(01) =	0
	Prob>chibar2=	1

Source: Study Findings (2023)

In the LM test, the null hypothesis is that the variance among entities is zero. This means that there is no statistically significant difference between the units (i.e., no panel impact). Because the P-value (0.000) in Table 4.12 is less than 0.05, the null hypothesis is rejected and the alternative hypothesis accepted, indicating that there is a significant difference between the two units (the panel effect exists). In other words, rather than ordinal (pooled) regression analysis, the panel model, such as the Random effect model or the fixed effect model, is appropriate for studying the impacts of dividend pay-out on financial performance on registered SACCOS in Dodoma city.

Table 4.13: Hausman (1978) Specification Test

Variable	**Coefficient**		**Difference**	**Standard Error**
	B	**B**	**b-B**	**Sqrt(diag(V_b-V_B))**
	Fixed	**Random**		**S.E.**
DP	1.9737650	2.3221130	-0.3483483	1.212169
L_DP	-0.0309035	0.2401636	-0.2710671	1.307199
Chi-square test value	48.55			
P-value	0.000			

Source: Study Findings (2023)

The Hausman test is shown in Table 4.13 employed to determine which model is best for estimating the relationship between dividend pay-out and financial performance.

The Hausman rest is always used to determine whether there is endogeneity, in this case, the fixed effect model should be used, or whether there is no endogeneity, in this case, the random effect model should be used. The finding in table 4.13 shows that the fixed effect model is appropriate since the probability (Prob>chi2 = 0.00) was less than the level of significance is 0.05.

Fixed Effect Model Regression Analysis:

Table 4.14: Regression Results for Fixed Model

Leverage	**Coef.**	**St.Err.**	**t-value**	**p-value**	**[95% Conf**	**Interval]**	**Sig**
Dividend pay-out	0.116	.025	4.75	0.000	0.068	0.164	***
Lag Dividend Pay-out	0.060	.025	2.37	0.018	0.010	0.109	**
Constant	-0.731	.396	-1.85	0.065	-1.509	0.046	*
Mean dependent var	0.616			SD dependent var			0.259
R-squared	0.363			Number of obs			1192.000
F-test	112.312			Prob > F			0.000
Akaike crit. (AIC)	-713.025			Bayesian crit. (BIC)			-687.608
*** p<.01, ** p<.05, * p<.1							

Source: Study Findings (2023)

Table 4.13 shows the Hausman test, which is used to identify which model is optimal for evaluating the link between dividend pay-out and financial performance. The Hausman remainder is always used to assess whether there is endogeneity, in which case the fixed effect model is appropriate, or if there is no endogeneity, in which case the random effect model is appropriate. Table 4.13 demonstrates that the fixed effect model is suitable since the probability (Prob>chi2 = 0.00) was less than the level of significance of 0.05.

The predictor factors (dividend pay-out and lag dividend pay-out) had a significant influence on the financial performance of registered SACCOS in Dodoma. Dividend payout was statistically significant (P 0.01) and had a positive influence on ROA, with a regression coefficient of 0.116, which means that for every 1% increase in dividend payout, ROA improved by 0.116 percent. Lag dividend pay-out was statistically significant (P 0.05) and had a positive effect on dividend pay-out with a regression coefficient of 0.060, which means that for every 1% increase in the lag dividend pay-out ratio, ROA increases by 0.060%. According to the study's positive correlation, registered SACCOS with a high level of fixed assets opt to finance new investments with a dividend pay-out ratio.

Table 4. 19: Summary of Hypotheses Tested

Hypothesis	Results
Hypothesis 1: "There is a negative relationship between dividend payout and financial performance	Accepted

Source: Study Findings (2023)

CONCLUSION AND RECOMMENDATIONS

According to the findings, the predictor factors (dividend pay-out and lag dividend pay-out) had a significant impact on the financial performance of Dodoma-registered SACCOS. Dividends pay out statistically (P 0.01) and have a positive influence on financial performance with a regression coefficient of 0.116, implying that for every 1% increase in dividend payments, financial performance improves by 0.116 percent. Also, delayed dividend payments were statistically significant (P 0.05) and had a positive influence on dividend payments with a regression coefficient of 0.060, implying that for every 1% increase in dividend payments, ROA increases by 0.060%. The favorable relationship demonstrated in this study indicates that registered SACCOS in Dodoma city provide high-quality service. It was discovered that dividend pay-out was positively associated to financial performance when exhibiting the elements impacting the financial success of registered SACCOS in Tanzania. As a result, businesses should boost revenue to guarantee that they earn more from their activities, as profit adds considerably to the financial success of Tanzanian SACCOs. There are several drawbacks to this study. To begin, there are a few SACCOS engaged in this investigation. Second, there are insufficient financial resources to finance research efforts. Third, there is a lack of time, particularly during data collection, and fourth, it is difficult to acquire all data in the intended years. Based on the study's limitations, the researcher advises more research on the financial performance of all SACCOS.

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Effect of Lead on Hematological Parameters and Serum Biochemistry of Bighead Carp (*Hypophthalmycthys nobilis*)

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Abstract:
The present study was planned to check acute toxicity of lead in bighead carp. Fish were exposed to two sub-lethal concentrations (5 and 10 mg Pb/L) for 96-hour. Blood was sampled after metals exposure to check the alterations in hematological as well as serum biochemical parameters. The analysis of hematological parameters and serum biochemical parameters showed that high concentration of Pb affects more the count of red blood cells, white blood cells, hemoglobin, MCV, MCHC, MCH, total Cholesterol, Glucose, total protein and albumin than low dose which, in turn, affect physiological condition of fish.

INTRODUCTION

Water is main natural resource which directly concern with human's welfare. Due to dispersion of urban and industrial waste products produced by social activities is the main cause of pollution in water and soil (Kumar, 2004). Some important applications of cultivated soils like uncontrolled dispersal of waste products, smelting and mining of metalliferous ores, process and accidental spillage is responsible for transferring the heavy metals into the non-contaminated sites (Ghosh and Singh, 2005). Heavy metals are the main cause of contaminations which includes organic and inorganic components like textile and phenol dyes, petroleum products, spoilable and explosive substances etc. (Gad et al., 2008, Jadhav et al., 2010). In seas, metal pollution is less visible but directly affect the marine organisms. The existence of metals is depending upon different fish features like developmental stage, fish age and also varies of fish species (Emami et al., 2005).

Metals can affect the fish body in two ways, one is directly depositing the metals into their body, second is indirectly transferring of metals by using their trophic level in food chain (Shah and Altindag, 2005). In aquatic bodies fish can be used as bio-indicator of metal's contamination (Javed, 2005). For the regulation of biochemical and physiological functioning in fish minute quantity of metals are important. However, when metals exceed from tolerance limits of fish, then affect physiological condition of fish (Bu-Olayan and Thomas, 2004). Presence of heavy metals is toxic for fish immune system, which leads towards declined in mortality, pathogenicity and its population (More et al., 2003). For the determination of fish toxicity, the acute methods are used because these methods give the rapid results of contaminated effects on aquatic organisms (Kai Sun et al., 1995).

Lead is a non-essential but toxic metal, which released from different sources like refining of ores, fertilizer and chemical industries in aquatic ecosystem (Handy, 1994). However, through leaching and erosion of soil lead enter into the aquatic ecosystem (Moore and Rainbow, 1987). Through gills lead enter into the fish body and attached with the mucus layer. Lead also enter in fish with water and food then absorbed into the intestine and other organs of fish (Kotze et al., 1999; Ay et al., 1999; Macdonald et al., 2002, Hensen et al., 2007). Likewise, accumulation of heavy metals

into the organs of fish depend upon different factors specially uptake rate of metals, storage and elimination (Roesijadi and Robinson, 1994; Longston, 1990).

Unsuitable ecological factors or the existence of stressing features with toxic chemicals alter the blood biochemistry of fish (Barcellos et al., 2004). When fish expose to the heavy metals, biochemical and physiologic parameters can change the blood sequence in fish (Cicik and Engin, 2005). When fish exposed to metals and their mixtures than fluctuations in the hematological values observed. Some hematological keys like red blood cells, white blood cells, hematocrit, hemoglobin and so on, used in aquatic environment as an indicator of metal contaminations. Due to the same factors erythrocytes cause stress in fishes (O' neal and Weirich, 2001).

Change in blood biochemistry may be symptomatic of inappropriate environmental factors like pH, temperature and oxygen concentration and also existence of toxic metals as stress factor (Barcellos *et al.,* 2004). When fish expose to metals they show biochemical and physiologic changing in tissues and blood of fish (Cicik and Engin, 2005). The level of serum glucose, cortisol, protein and cholesterol can increase or decrease due to presence of metals and also change enzyme activity of serum which depend upon metal type, time of experiment, water quality and types of fish (Vaglio and Landriscina, 1999; Monteiro et al., 2005). For the isolation of target tissues of toxicity and check the overall health conditions of organism's measurement of serum biochemical parameters can be particularly valuable (Folmar, 1993; Jacobson and Keller, 2001).

MATERIALS AND METHODS

Fingerlings of bighead carp (*Hypophthalmycthys nobilis*) were used for the experiment. The animals were transported from fish hatchery to laboratory in University of Agriculture Faisalabad. They were acclimatized to water for 14 days in four experimental tanks (PVC, 17 liters). During the exposure period, the physicochemical parameters were checked on daily basis. Continuous aeration was delivered to each glass aquaria through a pump fitted with capillary system. Chemically pure compounds of lead were dissolved in ionized water and stock solutions were prepared. Blood was taken by caudal vein using plastic disposable syringe fitted with 26-gauge needles. The syringe was already moisture with heparin. The whole blood was used for the estimation of hemoglobin, erythrocytes and leucocytes count, remaining blood sample were centrifuged for 20 mints at 10,000 rpm and plasma was separated for the estimation of serum biochemical parameters.

Hematological Parameters

The red blood cells count was complete by Neubauer Hemocytometer. Blood was diluted 1:2 with Hayem's solution. Entire quantities were described as10^6 mm^{-3} (Dharam et al., 2008). The white blood cells count was also prepared by Neubauer Hemocytometer. Blood was diluted in 1:20 with Turk's diluting liquid and located in hemocytometer. The total number of WBC was quantified as10^3 mm^{-3} (Emere et al., 2013). Hematological parameters were tested in triplicates. RBC: 106 cells μl^{-1} and WBC: 104 cells μl^{-1} were calculated by hemocytometer technique (Sadness et al., 2002). Hematocrit (Ht v/v ratio or %) was measured by micro hematocrit method and hemoglobin conc. (Hb gl^{-1}), red cell indices, MCV (μm^3 $cells^{-1}$), MCH (pg $cell^{-1}$), MCHC (%), were calculated by cyanometer hemoglobin method (Lee et al., 2010).

Serum Biochemical Parameters

The blood in the Eppendorf tubes was permitted to coagulate at room temperature, almost 25° °C, for 30 min. Serum was separate from the coagulated sample later centrifugation at 3,000 rpm for

5 mints and freezing at 20 °C until chemical analysis. In Eppendorf tubes the serum was collected then analyzed for different serum parameters. The following parameters were calculated and stated in the given units: total cholesterol, glucose, total protein, albumin.

STATISTICAL ANALYSIS

Statistical analysis was applied by Mintab software. Analysis of variance was used to check statistical differences among variables.

RESULTS

Erythrocyte and leukocyte numbers are presented in Table 1. In the control group, overall erythrocyte number was predictable as 18.86±1.82 $10^6 mm^3$. In the lead exposure groups, the erythrocyte no. increased more after high dose exposure than low dose. Leukocyte no. predictable about 546.13±17.3 in normal, but in the investigational groups, excepting in the 5 mg l^{-1} Pb group, this no. improved about 558.48±28.22 and in the 10 mg/l Pb group, the leukocyte no. Increased more upto 689.49±28.22. Hemoglobin value was resolute as 26.85 g/100ml in the control group, hemoglobin values of fish expose to lead were higher than the control, even though, this alteration is not statistically significant after exposure to low dose of lead ($p > 0.05$). The MCV, MCHC and MCH values was also increased in lead exposure groups than the control group (Table1).

The fish was exposed to acute treatment to determine the serum biochemical parameters exposed to lead. The value of cholesterol, glucose and total proteins increased and albumin contents decreased in lead exposure groups than control group but change is not statistically significant. The presence of toxicants in the aquatic ecosystem exerts toxic effects at cellular and molecular levels which results in significant changes in biochemical composition of the aquatic biota. Physico-chemistry of test medium during acute toxicity tests were maintained throughout the exposure duration. Dissolved oxygen, carbon dioxide, sodium, total ammonia, potassium concentrations were maintained to a certain limit as requirements of trial. During these trials, mean water temperature, pH and total hardness were fixed at 32°C, 7 and 225 mg/L, respectively (Pandey et al., 2005). All the assessment ways presented substantial alterations for dissolved oxygen contents, total ammonia, sodium, potassium and carbon dioxide. Control medium had significantly higher dissolved oxygen contents of 6.16 ± 0.18 mg/L than those used for 3 metals throughout toxicity trials (Giguere et al.,2004)

Table 1. Hematological parameters of *H. nobilis* exposed to low and high concentration of Lead.

Hematological parameters	Control	Low values	High values
RBC (10^6 mm^3)	18.86±1.82	20.91±1.02	37.75±3.40
WBC (10^3 mm^3)	546.133±17.473	558.482±28.227	689.492±30.338
HB (g/100ml)	26.85±1.64	28.05±1.02	43.74±5.01
MCV (10^{-4} mm^3)	302.08±3.86	345.67±4.45	387.55±4.75
MCHC (%)	25.77±1.36	27.34±1.40	34.75±2.20
MCH (10^{-5} pg)	47.9±0.31	50.05±2.05	69.75±3.05

Values are means ± standard error.

Table 2. Serum biochemistry of *H. nobilis* exposed to low and high concentration of Lead.

Serum Parameters	Metals	Control values	Low values	High values
Total cholesterol	Lead	72.95±1.30	73.10±0.03	73.22±0.15
Glucose	Lead	6.30±0.80	5.56±0.29	5.30*±6.07
Total protein	Lead	17.81±0.58	16.51±0.58	14.02±0.47
Albumin	Lead	2.72±0.10	2.58±0.08	2.60±0.02

Values are means ± standard error.

DISCUSSION

Hematology of blood can provide information about the anatomy of fish, according to recent research work the exposure of lead concentrations showed significant changes in different hematological parameters. The present research work caused significant changes in hematological parameters as compared to control medium when exposed to different concentrations of lead. During lead exposure, increase and decrease in different parameters of hematology and serum biochemistry in the same way as observed by Witeska and Kosciuk (2003).

As compared to control medium, the present outcomes described that the hematological parameters were increased in number when exposed to different toxic metals. The number of WBC's was increased during lead exposure. Same results were observed by Mousa and Khattab, 2003 and increased level of WBC's observed as compared to control level. Change in hematocrit, red blood cells counts and hemoglobin conc. were observed due to leukocytosis actions in erythrocytic anemia with erythroblastosis (Vosyliene and Kazlauskiene, 2004). Change in blood biochemistry may be symptomatic of inappropriate environmental factors like pH, temperature and oxygen concentration and also existence of toxic metals as stress factor (Barcellos et al., 2004). When fish exposed to metals, they show biochemical and physiologic changing in tissues and blood of fish (Cicik and Engin, 2005). The level of serum glucose, cortisol, protein and cholesterol can increase or decrease due to presence of metals that can change enzyme activity of serum which depend upon metal type, time of experiment, water quality and types of fish (Vaglio and Landriscina, 1999 and Monteiro et al., 2005).

RBC's also increase, after high level metal concentration slight increase in hemoglobin was observed. The scientist also observed that reduction in blood cells explain the anemic condition due to low level of red blood cells. Failure in RBC's production, internal bleeding under stress condition and impaired osmoregulation may lead to reduce the total number of red blood cells (Joshi et al., 2002). The maximum decrease in total leucocyte count, hemoglobin concentration hematocrit value and in total erythrocyte was observed in exposed fish bighead carp during 48 hrs. Same results were obtained previously that reduce in hematocrit and hemoglobin concentration due to anaemia (Vinodhini et al., 2009).

During acute exposure of metals more mean corpuscular hemoglobin concentration, mean corpuscular hemoglobin and mean corpuscular volume were determined than control group. In contrast to this, Shah (2006), Talas and Gulhan, (2009); Kavitha et al. (2010) a observed decreased number of MCV, MCHC and MCH due to destruction in RBC's membrane as results in toxic stress of metals, during hemolysis. According to recent research work the level of glucose decreased during lead exposure in blood of fish from the control value towards on high level of metals exposure. The level of total protein primarily decreases in blood from low to high level. The previous results were also supported (Haney et al., 1992) due to reduction in red blood cells and subsequent release of cell substances into the blood, total protein level reduced to a certain limit,

and did not have significant (P>0.05) values from control to infected fish. In blood the level of glucose increases due to contamination of heavy metals because of intensive glycogenolysis supported by Bouck and Ball (1967).

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Strengthening Women's Potentials and Capabilities: A Perceived Strategy to Narrow the Gender-Gap in Land Rights in South-Western Uganda

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Abstract:
The gender gap in land rights operates within the broader context of the bigger gender gap in society which is rooted deeply in informal/normative and formal/statutory structures. Security of tenure is a major determinant of the ability of women to improve the productivity of the land they use, to rebalance decision making power within the household, and to raise their status in the household, the community, and as citizens. There is thus the need of succinct strategies to narrow the gender gap in access to and control of the land because unequal access to land is one of the most important forms of economic inequality between men and women and has consequences for women's capabilities as food producers and key contributors to human welfare. This study aimed at exploring the untapped potentials and capabilities of rural women that may be exploited to narrow the gender gap in land rights in Uganda. The study was conducted among the farmer groups and key informants in South Western Uganda. To narrow the gender gap in land rights, the study identified strategies for strengthening women's potentials and capabilities that included formation of women's groups, changing traditions and practices that discriminate against women in terms of land acquisition and land tenure security, increasing awareness and advocacy for women land rights, empowering them to obtain and defend their land rights and also to enhance their potential to utilize the existing legal legislations, legal aid and legal services.

Keywords: Women potentials, Women capabilities, Gender gap, Land rights

BACKGROUND

Land is an important productive asset for households that depend on agriculture for their livelihoods. Access to and control of land is synonymous with wealth, status and power of individuals at the household and national levels (FAO, 2011). Strengthening women's access to, and control over land is seen as an important means of raising their status and influence within households and communities. It has direct impacts on farm productivity, and can also have far-reaching implications for minimizing land related conflicts that are usually fueled by discontentment brought by unfair ownership, access and control of land between men and women.

Rights are defined as claims that are legally and socially recognized and enforceable by an external legitimized authority, be it a village level constitution, some higher-level judicial or executive body of the state (Bromley, 1991). Agarwal (1994) conceives land rights to encompass access, control and ownership of land in that access can be through rights of ownership and use whereas control over land means the ability to decide how land is used, how its produce is disposed of, whether it can be leased out, mortgaged, mortgaged, bequeathed or sold. Mamdan (2004) believes that rights to land is associated with social identity and thus empowers, gives

status and this makes it critical to examine not only household level land rights but also the distribution of land rights within the household. This explains why rights over land are synonymous with most conflicts in Sub-Saharan Africa.

Literature on women land rights shows that considerable gender gaps in access to and control over land do exist in Uganda as does in other countries around the globe (Agarwal, 1994; Adoko et al.,2011; Ahikire, 2011; Asiimwe, 2014; Kemigisha, 2021). Women as key contributors to agricultural productivity are less likely than men to own or have access to land. The land they do have access to, is often of poorer quality and in smaller plots (Sheahan& Barrett, 2014). Fewer than 15% of agricultural landholders around the world are women and 85% are men (Twyman et al, 2015). The percentage of women land owners ranges from less than 20% in several countries such as Nigeria, Peru to slightly over 50% in Ecuador and Malawi. Even in Malawi where women own land, they own less land than men (Slavchevska et al, 2016). In Uganda, the situation is comparatively similar. From a survey that was conducted in Kapchorwa District in 2009 by Women Land Link Africa (WLLA, 2010), findings revealed that only 8 % of married women owned land in their own right. The majority of women did not have land in their own right because in most cases, even when they saved money to purchase land, land agreements were written in their husband's names and the women had to sign only as witnesses (WLLA, 2010; Hanny, 2014;). Therefore, the endeavor to have equitable access, use, and control of land is particularly important given the fact that land is the key production resource (Ahikire, 2011; Kemigisha 2021). Unequal land tenure affects women's ability to access, use, control, and benefit from land, thereby limiting their economic empowerment and financial security. In many cases, women may be unaware of their rights to land, lack the documentation necessary to exercise those rights, or live in societies where social norms inhibit women's access to land. Studies have shown that a woman who holds land may be perceived as a threat to the existing gender norms and power structures within the community. Men who feel that their power is being threatened often target women to keep them in a place of fear and dependence. As a result, women experience gender-based violence (GBV) to dissuade them from exercising their land rights or threaten their existing property rights. As a consequence, the lack of land tenure security results in lower access to credit and inputs leading to inefficient land use, culminating into low agricultural productivity, food insecurity and land related conflicts as people resort to acquiring the land using forceful means. Closing the gender gap in assets—allowing women to own and control productive assets—increases their productivity and self-esteem (Kumar *et al.,* 2015). This study thus sought to explore the untapped potentials and capabilities of rural women that may be exploited to narrow the gender gap in land rights in Uganda.

PROBLEM STATEMENT

In general, men own more and higher value assets than women (Deere and Doss, 2006, Deere *et al.,* 2013; Quisumbing, 2003). In particular, women tend to own less land, whether solely or jointly, than men (Agarwal, 1994; Adoko *et al.,* 2011; Ahikire, 2011; Asiimwe, 2014; Deininger *et al.,* 2010; Doss *et al.,* 2013). A growing body of research demonstrates the importance of women's ownership of and control over assets for a range of development outcomes (Agarwal, 1994; Haddad *et al.,* 1997; Quisumbing, 2003; Tucker & Ludi, 2012; Kemigisha, 2021).

A woman who is empowered to make decisions regarding what to plant and what (and how many) inputs to apply on her plot will be more productive in agriculture, she will be better able to assure her children's health and nutrition because she is able to take care of her own physical and mental well-being (Smith *et al.,* 2003). FAO (2015) reported that if women had the same access to

productive resources as men, they could increase yields on their farms by 20–30 %. This could raise total agricultural output in developing countries by 2.5–4 %, which could, in turn, reduce the number of hungry people in the world by 12–17 %.

Despite the fact that policies targeting secure land rights for women exist in Uganda (The 1995 Uganda Constitution, the 2013 Uganda national Land Policy), the land sector in Uganda is still challenged by insecurity of tenure, overlapping and conflicting land rights between men and women. There is information gap on how utilizing the opportunities and untapped potentials embedded in strengthening women's capabilities can help to minimize the gender gap in land rights. This study was done to situate the problem within the broader topic of wellbeing and capabilities to conceptualize the perceived strategies for narrowing the gender gap in land rights in the context of women's untapped potentials and capabilities.

STUDY AIM

The main aim of the study was to assess the opportunities and untapped potentials of strengthening women's capabilities to narrow the gender gap in land rights in South-western Uganda

STUDY JUSTIFICATION

The results of this study will provide potential strategies for narrowing the gender gap in land rights and improve on the outcomes that come with land tenure security for all. They will further demonstrate the merits of strengthening the potentials and capabilities of women in the endeavor to attain societal development. The results of this study will contribute to SDG goal number 5 that targets gender equality, goal number 10 that emphasizes reduced inequalities and number 16 on peace, justice and strong institutions. Results from this study will help in identification of future directions for further studies plus replication of findings elsewhere.

THE CONCEPTUAL FRAMEWORK

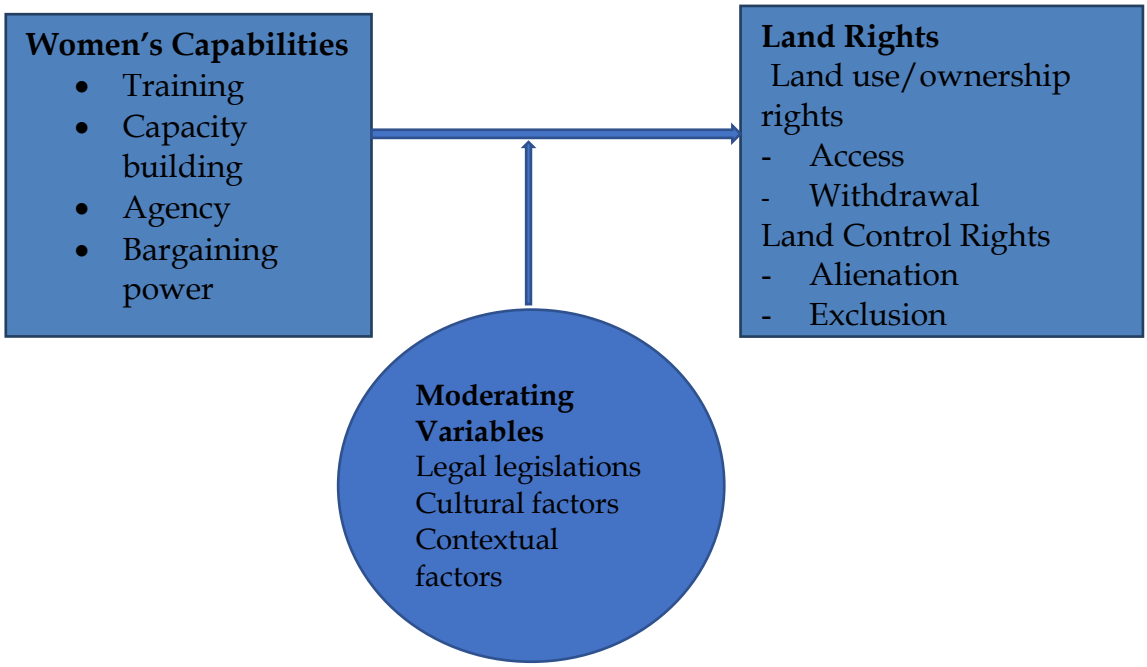

Figure 1: The Conceptual Framework

Adopted from the Global Land Tool Network on securing land and property rights for all –The Continuum of Land Rights Approach (2018) with modifications by the researcher.

The framework above presents the conceptualized link between women's untapped potentials and capabilities and women land rights. Women's untapped potentials and capabilities are the determining variables while women land rights are the outcome variables. In this relationship, it is assumed that strengthening women's capabilities and utilizing the untapped potentials of women can help to narrow the gender gap in land rights. The framework operationalizes women's capabilities in terms of training and capacity building, agency improvement and team/group strengthening while land rights is operationalized in terms of land use/ownership and control rights. The moderating variables include legal legislations, cultural and contextual factors.

THE THEORETICAL FRAMEWORK

The study was guided by the capability theory of justice (Nussbaum, 1995) together with the empowerment theory (Zimmerman, 1995) to provide the general framework for analysis/ understanding the opportunities and untapped potentials embedded in strengthening women's capabilities to narrow the gender gap in land rights.

Capability Theory of Justice

The capability theory of justice advanced by Martha Nussbaum, a political philosopher, is seen as a theory seeking to reduce social exclusion and inequalities and to enhance global justice. It was employed as the underpinning theory for this study due to its core and principled account of a set of fundamental human capabilities which are held to be essential to a good human life. Nussbaum (2003) offers an analysis of gender issues in development that follows from the "capabilities" approach to the analysis of quality of life. This theory builds on the work of Amartya Sen (1993), an economist, and philosopher, who pioneered the capability approach in the 1980s. Rawls (1999) and Robeyns (2003) point out that the capability theory of justice highlights on the difference between means and ends, and between substantive freedoms (capabilities) and outcomes (achieved functioning's).

Empowerment Theory

The empowerment theory on the other hand was integrated in this study in that it addresses individual responsibility which is lacking in the capability theory of justice. Empowerment theory is a construct that links individual strengths and competencies, natural helping systems, and proactive behaviors to social policy and social change (Rappaport, 1984; Zimmerman, 1995; Zimmerman &Rappaport, 1998; Kabeer, 1999). Based on this understanding of empowerment, land ownership should act as a source of empowerment by increasing women's security and influence and increasing their control over household decisions (Haddad *et al.,*1997; Agarwal 1997). To this study, the theory helps to conceptualize how empowering women in the ownership, access and control of the household land resource may translate into narrowing the gender gap in land rights.

METHODOLOGY

Selection of Study Sites

The study was done in Bushenyi district, Souith Western Uganda. Bushenyi District has 9 Sub-counties (Kakanju, Kyabujimbi, Ibaare, Kyeizooba, Ruhumuro, Bitooma, Kyamuhunga, Bumbaire, and Nyabubaare). Three (Nyabubaare, Kyamuhunga and Ibaare) of these were be purposively selected for this study because they have a rich mix of processes, people, programs, interactions and structures of interest that were crucial for this study. The sub counties share relatively similar political, social and cultural history and this made entry possible. From each of the selected Sub-counties, one parish was randomly selected for involvement in the study.

Study Population

The study population comprised of farmers groups and key informants. Farmers groups were targeted because group discussions facilitate thinking of group members and bring in a variety of responses on any issue raised. Key informants included LC 11 Chairpersons, Sub-county Chiefs, Lands Officer, Area Land Committee representatives, and NGOs representatives. LC 11 Chairpersons were the key gatekeepers for community entry and in selection of targeted respondents. Sub County chiefs were important in this study because they are government representatives at the parish level and deal with family and land related issues in their areas of jurisdiction. The Lands Officer and Area land committee representatives were considered for their technical experiences and knowledge on land issues in the district. The NGOs involved were selected basing on their orientation. For this study, representatives of Uganda Women Network (UWONET) and Action Aid International Uganda (AAIU) were involved because they are organizations that foresee other NGOs that deal with women's rights and advocacy in the country.

Sample Size and Sampling Procedure

Snowball sampling procedure (*Browne, 2005)* was used to select the three farmers groups (1 from each parish) to engage in FGDs. The local leaders (LC 11 Chairpersons) from each selected parish helped the investigator in identifying one member of the farmers 'group in their respective parishes who in turn helped to identify other group members and also helped in scheduling convenient dates and locations for the meetings.

The key informants were purposively selected and the sample size determined accordingly (Palys, 2008). The key informants selected for this study were 12 as shown in the table below;

Table 1: Sample size for key informants

Category of Key Informants	**Number**
LC 11 Chairpersons (1 for each of the three parishes)	3
Sub-county Chiefs (1 for each of the selected Sub-counties)	3
Lands Officer	1
Area Land Committee representatives (1 for each Sub- County)	3
NGOs (UWONET and AAIU)	2
Total	**12**

Research Methods and Tools

The study utilized both primary and secondary data sources; primary data was collected through interviews using an interview guide and Focus Group Discussions (FGDs) using a FGD guide. Secondary data was collected through document review.

Data Analysis

Thematic content analysis was used to analyze the transcribed anonymized data from the FGDs and key interviews. Themes and subthemes were chronologically developed and discussed following the study aim. The analysis of data was progressively done and coding done after every data collection day.

Ethical Considerations

Voluntary informed consent was obtained from each respondent after explaining the purpose of study. Participants and their responses during the FGDs and interviews were anonymized using

codes rather than names to ensure confidentiality. Administrative clearance was sought from the Local Council Chairpersons of the area of study. Respondents were not induced, bribed, coerced or even forced to participate in the study. A modest compensation amounting to 20,000/- shillings was paid out to the participants for their time transport refund.

PRESENTATION OF RESULTS

Table 2: Strategies for strengthening women's capabilities and empowering them to obtain and defend their land rights

Perceived strategies	Observations
Formation of Women Groups	• Women can explore the avenue of purchasing land as a group at a reduced cost per member. • Venture the possibility of leasing public land as a group.
Women's agency	• Women themselves should be proactive in advancing their rights. • Encouraging women participation in decision making • Encouraging women to bequeath their land to both sons and daughters
Awareness and advocacy	• Men should be given the duty of educating their fellow men to be supportive of women's land rights • Support girl child education and functional adult literacy in order to up lift the literacy levels among women. • Extension workers should ensure that they involve both husband and wife when they initiate government programs. • Training women as conflict mediators in land related conflicts. • Bring men and women on board in the implementation of development projects on land
Land ownership/ inheritance documents	• Husbands and Fathers should have wills spelling out how they would wish their land to be allocated when they die. • Women should be encouraged to have land that they purchase or inherit registered in their own names. • Women should maintain frequent visits to the inherited land (natal) to avoid encroachers
The role of Government and Civil Society Organizations	• CSOs need to refocus their agenda and redirect their priorities to intra-household gender dimensions in land ownership. • Government should facilitate women with an enabling environment to claim for their rights to land

Discussion of Results

According to the key informant from The Uganda Women Network (UWONET), the gender gap in land rights can be narrowed if new means through which women can gain greater ownership of and control over land are explored. Given the restrictions imposed by informal (normative), formal (statutory) and contextual factors, women can explore the avenue of forming women's groups and purchasing land as a group at a reduced cost per member. Women can also venture the possibility of leasing public land as a group for a longer period of time. These groups could also provide advice and assistance to women who wish to secure their land rights. However, this strategy was not supported by some women who said that holding land as a group presents management challenges due to group dynamics (such as lack of trust, death of a member, change of address etc.). This implies that what seems to work in one context may not work in another. Owning land as a group may have worked somewhere according to this key informant, but it was not greatly supported by most female respondents in Bushenyi district.

Women's capabilities can be enhanced through exposing both women and men to income generating projects that are carried out on land. This helps them to attain greater understanding and appreciation of the advantages that come with land tenure security for all. One of the key informants proposed that extension workers should ensure that they involve both husband and wife when they initiate government programs. When one of them is not brought on board, then he/she will be distanced from the whole project, and will not have any sense of ownership even if the project is beneficial to the whole family. He said that government programs that target to benefit individual households have failed to register success because the approach the implementers usually employ is not inclusive. The officers usually target an individual in a household and fail to realize that without participation from all household members, the introduced projects are bound to fail. He gave an example of a case that he handled where the NAADS (National Agriculture Advisory Services) officials gave out piglets to individuals for rearing. One woman beneficially failed to rear the piglet because the husband could not allow it on his land when he was not involved in the whole process of acquiring the piglet. The woman had to take it back to the NAADS officials in order to save her marriage. Similarly, another female respondent complained of a case where her husband sold off the goat, she had received from NAADS suspecting that the she could be having extra marital relationship with the NAADS officials.

My husband sold off the goat and when I asked, he threatened to kill me insisting that I was having intimate relationship with the NAADS officers. He was thinking like that because a few women from our village had benefited from the projectl. In actual fact, I benefited because I was consistent in attending the meetings. My husband commanded me to tell the officers never to step in his compound or else he beats them up. If my husband had been involved in the whole exercise, I would not have faced this challenge (FGD Nyabubare, 2022)

Women tend to favour their sons when it comes to allocation of family land most especially when their husbands die without living behind a will on how their property is to be distributed. This widens the gap in land rights (Kemigisha, 2021). A key informant noted that if the gender gap in land rights is to be narrowed, it must start from the women themselves appreciating that they are agents in this cause. He maintained that as they seek for external help from the government and support from the men, they also have to make sure that they start with themselves and bring fellow women on board through supporting them when they come out to advance their cause. It was noted that most women who come out boldly to advocate for women's rights and those who seek leadership positions are often not supported by fellow women. Such women are usually labeled as unruly and 'not womanly'- behaving in a way not considered being inappropriate of a woman. Therefore, the importance of women coming out as agents in narrowing the gender gap in land ownership and control is very paramount.

It was found out that possessing land without a land ownership document threatens women's land tenure security. A member from the District Land Committee mentioned that the gender gap in land rights can be minimized if fathers, husbands and women who own land should ensure that they write wills on how they would wish their property to be managed when they die. Most women usually end up losing everything to their in-laws and some even are chased out of their matrimonial homes when their husbands die. The key informant was of the view that the transfer of land to women should be well documented and should be done in the presence of a witness and most preferably, a lawyer. This would help the women to secure their rights to land. According to him (Land Committee Representative), women should be encouraged to have land that they purchase or inherit registered in their own names.

In order to maintain access to the land given to women in their natal homes, the respondents believed that this can be possible if these women are encouraged to identify means through which they can maintain access to their own lineage land (e.g., by planting cash crops on the land or by renting the land out). They should also maintain frequent visits to the land to ensure that there are no encroachers and it is being put to good use. It was revealed that women who inherit land from their parents sometimes take long before they visit to see their land. That period of absence usually gives the brothers opportunity to start using the land and subsequently take it over. In case where women face pressure from their brothers, then they should be encouraged to sell off the land and buy land which they can have full control over.

If you are lucky and your parents give you land, let your presence on that land be felt. Do something on the land! Keep visiting and checking on the boundaries. Practice effective occupation (Land Committee Representative, Ibaare, 2022)

Most of the respondents who participated in this study had limited knowledge of their land entitlements, they were not able to discern between customary law and statutory law and were unaware of the different mechanisms that exist for land dispute resolution and land administration in general. The study revealed that statutory laws were seldom applied to the benefit women in the district. Men and women had \little knowledge of existing laws, legal aid and legal services. This knowledge gap creates opportunities for those with more power (who are in most cases men) to unlawfully acquire more land and to exploit those with less power. The key informants from NGOs proposed that this could be achieved through increased legal awareness campaigns, non-formal and formal education programmes, legal literacy programmes, advocacy and lobbying.

The emphasis of titling of customary land in Uganda has done little to protect women's rights to land but has instead made them more vulnerable to dispossession (Asiimwe, 2014). The study reveals that the limited space that women had on family land was waning with increased individualization of family land that turns it into 'men's land' by virtue of being household heads. Giovarelli (2003) notes that as land becomes more valuable, land grabbing increases and women face greater threat of dispossession. In response to this challenge, the female respondents in the FGD conducted in Ibaare Sub- County proposed that both names of husband and wife should be included on the certificate of customary ownership. They believed that this would increase women's land tenure security and help them improve their agricultural productivity.

To most respondents in the FGD conducted from Nyabubare Sub- County, literacy campaigns would help to increase women's capabilities and empower them to take advantage of the opportunities that come with increased literacy. Majority of the female respondents in the group revealed that they had attained low levels of education and thus could not easily interpret nor understand the land related policies.

Most of us have not gone to school and we do not understand the documents we are expected to fill when we take our land disputes to court or when we are following up on land registration processes. Even at the local level, we do not comprehend the procedures and we end up giving up our claims. If we were given some literacy lessons on basic land issues and policies, maybe we would ably stand and fight for our rights. (FGD (Female respondent) Nyabubaare, 2022)

Education plays a major role not only for individual's opportunities in society, but also for the productive capacity and wellbeing of a household (UNDP, 2002). Almost universally, studies that analyze income, agricultural production, and other measures of welfare find that education, - human capital available in the household (usually measured as the education of the head of household, or the average education of working age adults) - is strongly correlated with these (UNESCO, 2002)

The district Lands Officer was of the view that if the roles, functions and mandates of the different institutions involved in administration of land justice were well elaborated, the gender gap in land rights would be narrowed. This is because women need to be informed of their land rights entitlements and need to know when, how and where to claim rights from the rights bearers such as the community leaders, courts of law, and police. He supposed that the land law policy documents and acts need to be interpreted to the language of the local populace in order to be well understood. He said that that can be achieved through developing appropriate and effective means of communication and information dissemination by having sensitization seminars and workshops on land issues moving up-country. The message has to be understandable to both literate and illiterate persons and that the dissemination programme should not be left to the Lands office alone but actively involve other highly respectable members in society such as religious leaders, village leaders, village elders and teachers. The strategy raised here supposes that Functional Adult Literacy campaigns would empower women to utilize the available legal services regarding their rights to land.

The key informants most especially from civil society organizations alleged that the establishment of functional and effective land committees in the villages and parishes to help women access recourse mechanisms to address land issues would go a long way in narrowing the gender gap in land rights. In addition to the land committees, there is also need to re operationalize land tribunals because magistrate courts were reported not to be helpful since they had a backlog of criminal and civil cases. According to them, land tribunals are less formal but legalistic and they are assumed to be more accessible to ordinary people and bring justice closer to the community. This presupposes that if such committees and tribunals were given the technical and financial support they needed, land related injustices would reduce, and women would be in a better position to claim or uphold their rights to land.

Respondents supposed that the land administration department should work to reduce on the bureaucracy and to improve the land registration function. They suggested that vacant positions need to be filled up with technical staff. The study findings revealed that the office of the Land Registrar in the district was still vacant. To acquire a land title, people in the district have to travel to the regional land office in Mbarara which is also not devoid of bureaucracy and other related technical challenges. As if that is not enough, the study findings reveal that the cadastral processes are too long and expensive and therefore not manageable to most people most who would be interested in acquiring land titles. Despite the fact that this affects men and women, the magnitude with which it affects women is more than their male counterparts because of the existing gender gaps in education, income, and other socio-cultural constraints.

The District Lands officer was of the view that informal mechanisms of land dispute resolution should be promoted with clear regulatory framework and a clear hierarchy. He said that there was a strong perception that formal justice options were largely punitive and did not promote reconciliation. He suggested that if Local Councils, elders and community leaders are empowered

with appropriate knowledge and skills to handle the land related disputes, it would see many women seeking legal redress in case of violation and this would go a long way in narrowing the gender gap in land ownership and control. The LC courts therefore need to be technically supported and promoted because they are physically and technically accessible by the rural population. Rugadya *et al.,* (2008) notes that LC courts are friendly, faster and people have confidence in them and identify with them compared to the formal courts. The respondents echoed the need for training women as conflict mediators in order to help them build community skills and increase the probability that their concerns relating to land rights would be addressed. This was in line with Rugadya & Busingye (2002) who assert that participation of women in local land management and administration committees including land dispute resolution/management committees is basic for women's empowerment as it enables them to take part in community level decision making processes.

Female farmers who participated in one of the FGDs proposed that the government should always come in to facilitate women farmers with low interest loans without putting emphasis on land as collateral security. They believed that if credit facilities are availed basing on social capital other than land, many women would benefit because they are able to accumulate social capital through forming women's farmers groups and other women's associations. With increased social capital and economic empowerment, women are able to collectively fight for their rights and also gain increased access to resources. A key informant from Action Aid International Uganda (AAIU) suggested that women need to be strong enough to assertively present their cause without being destructive because property rights continue to be a contentious issue in Uganda as evidenced by the hot debates in parliament whenever bills related to property rights are raised. The marriage and divorce bill were shelved for many years though it was finally put on the order paper in the 10th and 11th parliament. The property related clauses that emphasize protection of women during marriage, divorce and separation are not well received by parliamentarians and whenever the bill is tabled, the debate becomes tense and they end up shelving it time and again.

Despite the fact that civil society organizations and movements are instrumental in improving the social and economic conditions of the vulnerable people in communities where they operate, they tend to focus on family issues (health, economic status, health) and on class (the landless, the rural poor, the refugees) while ignoring the power dynamics and gender inequities within the households (UNDP, 2014). There was agreement among most women respondents from the different categories (FGDs NGO representatives and the technical personnel) who participated in this study that these organizations and movements need to refocus their agenda and redirect their priorities and start with intra-household gender dimensions and then move on to the inter household and the wider community. Intra household allocation of productive resources most especially land, needs to be gender sensitive. The respondents maintained that since these organizations usually aim at helping the vulnerable groups in society, their direct involvement with household members would lead to greater improvement towards the achievement of gender equity in land ownership and control. In support of CSO work, the state through donors needs to increase resources in form of financial and technical assistance most especially to the local NGOs that offer legal aid and other services to women.

To most key informants, the gender gap in land rights can be narrowed if there is commitment from the government to guarantee equal participation of men and women in agriculture through an enabling social, legal, economic and political environment. The respondents emphasized that this can be achieved when women are given the opportunity to participate in the policy

formulation and implementation process. They upheld that representation of women on land committees, tribunals, boards or other bodies responsible for distributing or overseeing land rights should be an important step towards helping women gain access to established rights. Most female respondents perceived that women's voices need to be heard and they should not be seen as being placed in positions as the government's way of gaining popular support. Through increased women's involvement in decision-making processes at the household, community, district, regional and national levels, their leadership skills are enhanced and they become more confident to claim their land rights.

CONCLUSION

Security of tenure as evidenced by this study is a major determinant of the ability of women to improve the productivity of the land they use, to rebalance decision making power within the household, and to raise their status in the household, the community, and as citizens. Closing the gender gap in ownership, use and control of land therefore unlocks the productivity potential of women and increases their capacity to make meaningful decisions. Strengthening women's capabilities and empowering them to obtain and defend their land rights through increasing the utilization of existing legal legislations, legal aid and legal services goes a long way to narrow the gender gap in land rights.

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A Comparative Analysis of the Effects of Academic and Non-Academic Outcomes of Faith-Based Education on Students in Public Secondary Schools in Jinja City, Uganda

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Abstract:
The study sought to assess comparatively the effects of academic and non-academic outcomes of faith-based education on students in public secondary schools in Jinja City, Uganda. This was done by identifying the components of faith-based education, finding the out-of-school outcomes of faith-based education, and establishing the academic outcomes of faith-based education. This was well-balanced among both male and female informants. The qualitative approach was used to collect data using interviews and focus group discussions from both male and female informants who included; teachers and students, results were analyzed thematically and presented verbatim. The results found out that faith-based education is a multidimensional discipline that covers facts from both the Old and New Testaments of the Bible and is divided between Islam and Christianity. It has numerous out-of-school benefits, such as promoting unity, preventing conflict, and developing a fear of God. It has also been found to reduce drug addiction/abuse, improve community security, and make a significant contribution to HIV/AIDS prevention. It is concluded that it is essential for schools because it enables students to respect others, develop a more nuanced understanding of other people's beliefs, learn more about international affairs, strengthen their sense of well-being and ethical standards, and find personal happiness. Additionally, religious education can aid in classroom discipline and reduce "juvenile delinquency" within families. Based on the conclusions, the study recommends that the Ministry of Education and Sports ought to put an environment where religious education instruction provides them with systematic information and comprehension of a variety of faiths and beliefs, foundation bodies of schools should ensure that students' propensity for discussion be fostered for them to become religiously literate, and the management of schools should set policies which ensure that students acquire and use the knowledge and abilities necessary to comprehend, interpret, and assess texts, authorities and other types of authorities.

Keywords: Academic outputs, Non-Academic outputs, Learners Engagement, Foundation Bodies, Education in Uganda.

BACKGROUND OF THE STUDY

According to Ellisa and Harfian (2019), students will lose direction if they do not acquire a sense of identity. The goal of faith-based education is to decrease the detrimental impact of technology by sharpening morals and character, increasing hours of religious studies, developing a faith-based learning environment at school, and incorporating components of moral education into all student activities.

Faith-based education, according to Roman et al. (2021), aims to make religious lesson participants more mature and conscious of themselves as individuals, rooted in culture, and capable of creative criticism and reflective affirmation of the social and cultural reality that

surrounds them (Kostorz 2018; Abendowicz 2019; Zellma 2017). Religious education aims to build skills and shape the attitudes of participants in religious classes as well as acquire new knowledge (Baoniak 2020; Zellma 2020). "Its job is to guide a person to an autonomous and reasonable explanation of human life and to assist them in understanding themselves and the world within the context of their faith" (Konferencja Episkopatu Polski, 2018).

Faith-based Education instils virtual qualities in individuals like obedience, humility, meekness, love for one's neighbour, and forgiveness of offences. There is a belief that obedience, neighbourly love, and forgiveness are particularly vital for social integration and, by extension, societal growth (Agunwa 2017). "Man learns via his religion that certain activities are good or harmful, and this drives him towards leading a virtuous life," writes Onah (2017). This is required for healthy interpersonal interactions as well as national growth. Religious education, according to Ezeanya (1988), is primarily concerned with creating a feeling of the holy in man and reminding him that human existence has a terminus a quo (point of departure) and a terminus ad quem (point of arrival).

The Ugandan NCDC (2009) promotes responsible, unselfish living in society, which leads to societal cohesion and development, regarding Christian religious education and the Christian Ten Commandments. According to the Ugandan NCDC (2009), "the student receives advice on how to act through the use of the Ten Commandments." It also educates the student not to abuse and defraud the impoverished (p. 5). Mistreatment and deception of the poor, on the other hand, are key drivers of underdevelopment in Nigeria and the Third World in general. According to Ezeilo (2017), "Despite the resources or contributions created by some of these villages and communities, the government's insensitivity to the yearnings and agitations of the disadvantaged impoverished groups continues to rise."

According to the Ugandan NCDC (2009), "the student is supposed to gain an awareness of the traits Jesus possessed and how He served other individuals without prejudice. The student then puts ideas into practice in daily life." Discrimination based on ethnic and religious lines is a fundamental impediment to growth and social harmony.

The Ugandan NCDC (2009) teaches that "peace is a gift from God." It is incomprehensible to us. Peace is vital and may be maintained through praying, following God's commands, and adhering to national laws" (p. 23). The future Messiah [Jesus] is referred to be the Prince of Peace in Isaiah 9:7. This is in contrast to the violent acts of roaming Fulani herdsmen that Nigeria has been suffering and that the government has remained quiet about, and which have slowed Nigeria's progress. Consequently, to encourage progress in Nigeria, Nigerian Christians must continue to pray, endure, and strive for peace, as their religious education requires (but not without conciliatory measures) (P O Azuakor 2019).

Uganda's secondary school curriculum mandates the teaching of faith-based education, currently in the form of Christian and Islamic religious education in secondary schools where some students choose to study Islam while others attempt Christian religious education. Most importantly, a student from a Christian background may choose to handle tasks in Islamic religious education and one with a background of Islam may opt to go with Christian religious education as long as they deem it fit (Ssenyonjo. M, 2009).

The Ministry of Education commends Faith-based schools for their great and outstanding values and fear of God, producing God-fearing citizens who are great achievers. Faith-based schools are known for being very obedient, submissive and compliant with the rules and regulations put in place by the religious heads as was sighted in the new vision where church-based schools were instructed by Archbishop Kazimba Mugalu to plant trees (Fredrick Kiwanuka, 2022). This was unanimously observed by all the schools. These schools have not only inculcated and instilled discipline in learners, but they have also portrayed and displayed excellent academic performance right from primary to secondary levels of education (Joshua, 2022). Religious studies shall form part of the curriculum in primary and post-primary schools (Education Act 2008).

This paper, therefore, seeks to document facts from the secondary schools in Jinja North Division regarding the academic and non-academic contributions of faith-based education in secondary schools.

Purpose of the study

The study made a comparative analysis of the effects of academic and non-academic outcomes of Faith-Based Education on students in public secondary schools in Jinja City.

Specific Objectives

1. To identify the components of faith-based education taught in secondary schools in Jinja North Division, Jinja City.
2. To find out the out-of-school outcomes of faith-based education taught in secondary schools in Jinja North Division, Jinja City.
3. To establish the academic outcomes of faith-based education taught in secondary schools in Jinja North Division, Jinja City.

Theory of the Study

The study was conducted using the Faith development theory advanced by James W. Fowler from 1940-2015 in America. Faith Development Theory is an interdisciplinary approach to understanding the evolutionary process of the development of religious/spiritual values and behaviour in the human life cycle. On a positive note, the theory stresses the notion that human beings conceptualize the "ultimate environment," the versions of the world that individuals create in their minds that shape how they understand and live in the real world.

This automatically Fowler explained that the differences among belief, faith, and religion are associated with the ultimate environment in that individuals' beliefs allow them to convey their ideas about this environment. In addition, the theory indicates that religion operates as a specific method of faith and its notion of the environment. Faith results from interactions and experiences that individuals have in the various components that make up their lives, and unites these components so that they can feel their lives are "whole". The theory is relevant to the study as it stresses that a student first internalizes the essence of religion and then relates what they have internalized to the outside world. On the academic side, the theory stresses that while in school, a student learns the essence of religion, and when out of school, the fruits of faith become logical when they develop helping hearts and other positive forms of lifestyle in society.

LITERATURE REVIEW

Components of Faith-Based Education Taught in Secondary Schools

Each school's religious education program should be more than just a small percentage of the overall curriculum (L.Woessmann, 2022). It must permeate the welcoming atmosphere at the institution because students are the ones who spread moral values, which are the ones that are most respected and cherished for the quality of interactions among all of humanity, such an atmosphere benefits not only the school but also society as a whole (Hills & Donald, 2015). With more methodical and thematic study, students continue to learn about the religions and civilizations covered by the curriculum. Students examine the practices and beliefs of several major faiths, considering various religious expressions, learning about parallels and divergences within and across religions and the value of discourse between them (Margaretta, 2015).

Religion is itself an important contributor to life where schools need to have at least 5% of curriculum time, have their own guaranteed place in the timetable and be offered throughout the school from the foundation stage to secondary school. Schools should ensure extra merit to all students and should have no less reward than the head of English or Mathematics (Margaretta, 2015). Schools will consider the communities and the setting in which the children and young people live and develop when making plans for religious and moral education (Taylor and Francis,2004). All children and young people will have an awareness of Christianity, which has affected Scotland's history and customs and continues to have an impact on national life, via their study in religious and moral education (Katja, et al. 2022). It is also a fundamental premise that, whatever their circumstances or the local environment, all children and young people in Scotland will consider a variety of faiths and viewpoints. Children and young people will be able to extend their learning well beyond the local environment to national and worldwide contexts as they mature because of the experiences and outcomes (Katja, et al. 2022).

Learning should be coherent, progressive and meaningful, and should be planned for and taught in ways that encourage learners to recognise that the knowledge, skills and attitudes identified are inextricably linked. These aspirations are only achieved through high-quality teaching, learning, and the establishment of a supportive climate for learning (Yaarit and Riad, 2022). All teachers have an important role in modelling and promoting an ethos of inclusion and respect for individuals. Teachers will ensure that children and young people from any faith are treated with sensitivity (Yaarit & Riad, 2022). While some may wish to discuss their faith, others may not. Teachers should not assume that any child or young person should be automatically drawn upon as a source of information. Viewpoints independent of religious belief can be considered within the learning and teaching approaches adopted for Christianity and world religions selected for study (Yaarit and Riad, 2022). The experiences and outcomes in the development of beliefs and values support the development of a broader understanding and permeate learning and teaching (Yaarit & Riad, 2022).

To gain a depth of understanding, judgments must be taken on the various religions that will be studied in addition to Christianity (Yaarit and Riad, 2022). Recognizing local conditions and expectations is crucial, as is including parents in decision-making. Also, it's crucial to avoid covering too many different religions and topics superficially because this might be perplexing (Yaarit and Riad, 2022). In light of this, it could be suitable for many elementary schools to concentrate on no more than two other global faiths in addition to Christianity. Although one or more faiths will be examined in-depth, teachers may also choose to incorporate a few carefully

chosen elements from other religions, maybe as part of an interdisciplinary learning environment (Amalee, 2019).

Out-Of-School Outcomes of Faith-Based Education Taught in Schools

A well-taught faith-based education will give students a broader, healthier perspective on life compared to their peers. A worldview that is based on Biblical principles will be one of selflessness, acceptance, and love for their fellow man (Ellisa & Harfian, 2019). With diverse lessons on myths, figures, events, and locations of particular significance as well as artifacts and beliefs that are a part of contemporary life and society, it introduces students to other cultures and faiths. The use of students' imaginations and senses of wonder in their responses to all faiths, traditions, and civilizations is encouraged. Their knowledge of many religions helps them to form a suitable, secular worldview and a strong local religious community (Mark, et al. 2022).

The depth of a student's awareness of diverse faiths is influenced by their knowledge of cultures, religions, and beliefs in local, national, and international contexts (Mehmet, 2021). Students learn about rights and obligations and the value of interfaith communication as a solution to conflicts within and across religions and beliefs. Students get a deeper understanding of diversity, faiths, and beliefs, as well as how these factors affect people locally, nationally, and internationally (Mehmet, 2021).

Religion teaches equality, collaboration, peace, happiness, and other virtues that have a wide range of beneficial effects. Also, the existence of God preserves the moral foundation of society, which has a significant role in reducing crime and antisocial behaviour. Teachers might share their personal experiences as well as those of others who have developed a great regard for religion's spiritual side (Kreiner, 2020).

Every religion has a unique set of practices and beliefs. Every religion is multiethnic, with distinct ethnicities, languages, cultures, and practices in various communities, nations, and continents. It dispels certain myths and misconceptions about various religions. Sikhs are frequently mistaken for Taliban, even though, other than certain visually similar traits like beard and turban, there is a great sea of difference between them (Kreiner, 2020).

Academic Outcomes of Faith-Based Education Taught in Secondary Schools

Faith-based education offers the chance to examine a significant and unique aspect of what it means to be a person: the quest for meaning, purpose, and value in a wonderful but also sometimes perplexing and perhaps dangerous world. Students get the opportunity to discuss and reflect on enduring questions about life in faith-based education. In doing so, it relies on the lengthy histories of the primary religions and other worldviews in Britain, giving Christianity the prominence, it deserves to reflect the reality that the majority of Great Britain's religious traditions are Christian (schools web, 2022).

In Birmingham, there is a regionally agreed-upon syllabus for religious education that helps students comprehend the city's varied population and appreciate that every individual has their ideas, values, and beliefs. Students will learn how and why individuals occasionally disagree with one another and even find that Birmingham's residents have a lot more in common than they initially assumed (Simone, 2022).

Students must be able to perceive religious concerns and assess their relevance if they are to comprehend our rapidly changing environment (Kay, Polin, & Shira, 2022). Faith-based education teaches students significant insights into the many thoughts and perspectives held by individuals nowadays right from their first day of class. It promotes their comprehension of the spiritual, moral, social, and cultural issues that recur throughout their lives and aids in their personal growth. By discussing challenging issues, it gives students knowledge that may be used to combat extremism, foster cohesion, and challenge prejudices. Young people are encouraged to appreciate themselves and the communities in which they live via essential work done by faith-based education (Kay, et al., 2022). Sometimes teachers will invite a visitor into school to talk about what they believe or demonstrate what they do. This again helps students to learn interestingly. Our children & young people need to learn to be respectful of both their own and other people's beliefs & cultures. This helps make schools & communities a fairer place for everybody, whatever their religion, culture, language or background (Katja, et al. 2022).

Students are integrating tales from religious traditions as part of their personal, social, and emotional growth through hearing and responding to them. They can use their knowledge of communication, language, and reading to participate in festivities and special events (Ellisa & Harfian, 2019). When students begin to inquire about religion, culture, and worship and adopt attitudes of inquiry and respect, their knowledge and awareness of the world, grow as a result of the use of artifacts, music, tales, and artwork from many cultures (Ellisa & Harfian, 2019).

RESEARCH METHODOLOGY

The study utilized a qualitative data collection approach by conducting semi-structured interviews and focus group discussions among teachers and students. Thematic analysis was employed to analyze the collected data, which was then presented verbatim. Both male and female teachers participated in the study, although a higher proportion of male teachers were involved in teaching religion. The study had a significant number of male and female students, resulting in almost equal representation of both genders in the data. Table 1 displays the demographic characteristics of the respondents.

Table 1: The demographic characteristics of Respondents

Participants Items		**Number of respondents**	**Percentage of respondents (%)**
1. Gender	Female	38	49
	Male	40	51
	Total	**78**	**100**
2. Age	20-25	16	21
	26-30	24	31
	1 and above	38	48
	Total	**78**	**100**
3. Work experience	Less than 5 years	35	45
	6 years and above	43	55
	Total	**78**	**100**
4. School	Mpumudde seed Ss	26	33.3
	St.StephenS.S Budondo	25	32.1
	St. John SS Wakitaka	27	34.6
	Total	**78**	**100**

Source: Primary data

Table 1 shows the demographic characteristics of the participants in the study, which was conducted in the secondary schools in Jinja North division, Jinja district. The results indicate that there were 78 respondents, with an almost equal gender distribution of 49% females and 51% males. In terms of age, 21% of the respondents were between 20 and 25 years old, 31% were between 26 and 30, and 48% were 31 years old and above. When it comes to work experience, 45% of the participants had less than five years of experience, while 55% had six years or more.

Components of Faith-Based Education Taught in Secondary Schools

One of the views from a student was that;

> *Faith-based education, which here we can call religious education and which is almost compulsory, teaches mostly about different principles of religious lifestyle. Most importantly, it is divided between Islam and Christianity. This is because, in every school, there is one set of Muslim students and another set of Christian students. Therefore, because it is difficult to compel a Muslim to attend Christian lessons and a Christian to attend Islamic lessons, the syllabus caters to all.*

The study aimed to investigate the components of faith-based education taught in secondary schools. The findings indicate that the faith-based education syllabus covers facts from both the Old and New Testaments of the Bible This is confirmed by the responses of most of the teachers who participated in the study. However, the students approached the notion of the components of faith-based education with varying degrees of skepticism. One student's view was that faith-based education, which is almost compulsory, teachers mostly about different principles of religious lifestyle. The syllabus caters to both Muslim and Christian students, who are taught separately to respect their beliefs One of the students in a group was quoted

> *In my view, faith-based education is divided into three papers, and two of the papers deal purely with things of God while another deals with things of this world. The purpose of this, I guess, is to ensure that one does not only get to learn how God wants the world to appear but also shows the public what they have learned about a religious lifestyle both in and outside of school.*

Moreover, the study found that faith–based education also contains content that discusses marriage. This type of instruction is designed to help students understand more about the marriage behaviours of religious people. The students stated that faith–based education is a multidimensional discipline that even handles issues at home such as marriage. This suggests that faith–based education is not limited to religious teachings but extends to other aspects of life. A teacher from one of the schools stated that people normally use the example of Jonah, whom God had sent to Nineveh, as follows:

> *Then the word of the Lord came to Jonah a second time: "Go to the great city of Nineveh and proclaim to it the message I give you." Jonah obeyed the word of the Lord and went to Nineveh. Now Nineveh was a very large city; it took three days to go through it. 4 Jonah began by going a day's journey into the city, proclaiming, "Forty more days and Nineveh will be overthrown." 5 The Ninevites believed in God. A fast was proclaimed, and all of them, from the greatest to the least, put on sackcloth. When Jonah's warning reached the king of Nineveh, he rose from his throne, took off his royal robes, covered himself with sackcloth, and sat down in the dust. 7 This is the proclamation he issued in Nineveh: .....*

Source: Primary data

Another aspect of faith-based education that emerged from the study is the language used. Teachers reported that when teaching faith-based education especially with examples, there is a need to compare a certain character in the Bible with the situation at hand in the outside world. The story of Jonah was cited as an example. Through the story of Jonah, students are taught to be forgiving just as God was. The teaching also promotes the knowledge that disobedience leads to trouble, just like it did with Jonah. This indicates that faith-based education not only teaches religious values but also promotes moral and ethical values.

Out-Of-School Outcomes of Faith-Based Education Taught in Secondary Schools

Table 2: Transcript analysis of the out-of-school outcomes of faith-based education taught in Secondary Schools in Jinja North Division, Jinja District.

	Teacher by school	Out-of-school outcomes of faith-based education	Response
1	**Teacher A**	Unity among community members	Because of the knowledge, I have about loved one another, I fear to hate others, be it at school or when I am out of school. I use this knowledge to encourage my brothers and sisters to always embrace unity, cooperation, and love for one another. This way, no one will hate the other, and we will be one, helping each other in times of need and standing up for one another for as long as we live.
2	**Teacher B**	Divorce is minimized for stable marriages	In the community out there, it is very easy to know someone who fears God. Taking the example of marriage, every person who has ever received knowledge that divorce is uncalled for will not mistreat their wives. The majority of stable marriages in communities exist because the married couple is God-fearing in the first place. Forsaking God could mean problems, which include quarrelling and fighting. Where there is unity, there is cooperation, and thus marriage stability.
3	**Teacher C**	Abstinence from acts of violence	The fact that we leave school with a fear of God, especially those who care to fear God, will lower crime rates in the community. For example, in cases where youths are found heavily indulging in drug addiction and smoking cigarettes, fear of God will prevail, and a student who has attended a religious education class will remember that first, drug addiction is a crime, and second, it is harmful to one's health. This is how faith-based education is so powerful.

Source: Primary data from secondary schools in Jinja North Division, Jinja District.

From Table 2 above, the teachers were asked a question on the out-of-school outcomes of faith-based education taught in secondary schools in Jinja city. Their responses were varying, for example; To foster loving one another, one should be exemplary to encourage others to embrace cooperation, unity and love for one another as declared by Teacher A from one of the schools. For a stable marriage, God should be at the centre. This helps to avoid quarrelling and fighting as noted by Teacher B from another school. Students who are God-fearing will not indulge in acts of violence like drug addiction, and smoking cigarettes which are harmful to one's health as stipulated by Teacher C from one of the schools. It is importanta to note that while faith-based education can provide these positive academic outcomes, it varies from school to school. The quality of teaching, resources and commitment to academic excellency can differ, so it is crucial

to consider individual schools to their specific approaches to faith-based education in Jinja city, Uganda.

Academic Outcomes of Faith-Based Education Taught in Secondary Schools

Table 3: Transcript analysis of academic outcomes of Faith-Based education taught in secondary schools

	Students by school	Academic outcomes of faith-based education taught	Response
1	**Student A**	Creates respect among students	Religious education has helped us better understand our faith. We are better familiar with the Bible and Jesus. We can learn from the saints' and other good people's experiences. We know how to respect our convictions. Our understanding of church theology expands. Religion studies and extols the goodness, truth, and beauty of God. Our ability to worship and pray with more empathy, understanding, and love is facilitated by religious education.
2	**Student B**	Helps students to comprehend the world	Our religious training gives us practical life skills. Reflecting on our acts can help us learn from them. Making difficult judgments is made easier through discernment. Critical thinking helps us better understand our mental processes. With the help of conscience growth, we may learn what God's will is for our lives.
	Student C	Promotes positive being in life	By posing difficult questions about life's meaning and purpose, religious beliefs, ultimate truth, moral dilemmas, and what it is to be human, religious education makes a significant positive contribution to children's and young people's education in schools.

Source: Primary data

From Table 3 above, students were asked about the impact of Faith –based education taught in secondary schools on their lives. The responses from students were varying, for example, some indicated that;

The teaching of faith-based education has helped us to create respect among themselves through reading the Bible, which makes them able to worship and pray with more empathy, understanding and love as cited by student A. Religious training gives practical life skills that help them learn by reflecting on their acts, making difficult judgments discernment, and develop their mental ability through critical thinking as confirmed by student B. religious education makes the life of students meaningful through religious beliefs, ultimate truth and solve religious dilemmas which makes a significant positive contribution to the student's education in schools as established by student C. It is important to note that the effectiveness and impact of faith-based education can vary based on individual experiences, the specific school and the level of implementation of its values and practices.

CONCLUSION

The study arrived at the following conclusions based on the findings;

Faith-based education has been designed with a syllabus that covers facts from both the Old and New Testaments of the Bible and is divided between Islam and Christianity (Ssenyonjo. M, 2009). It also contains content that discusses marriage, which is designed to help students understand

more about the marriage behaviours of religious people. Students view faith-based education as a multidimensional discipline that even handles issues at home (Mwesigwa FS,2013).

Faith-based education has numerous out-of-school benefits, such as promoting unity among community members and preventing conflict (Enock, 2018). It also reduces divorce cases and marriage stability. Additionally, students develop a fear of God and are encouraged to embrace unity, cooperation, and love for one another. Faith-based education has been found to reduce drug addiction among youth when they get out of school, improve community security, and make a significant contribution to HIV/AIDS prevention (Kagimu. M, 2012). Teachers have stated that students develop the spirit of love and the fear of crime and that if students are made to dread having several sexual partners, they will eventually fear God (Tinkatumire. L, 2011). Additionally, the government and development partners have been aided in maintaining community health by the availability and adoption of faith-based education.

Religious education is essential for schools because it enables students to respect others, develop a more nuanced understanding of other people's beliefs, learn more about international affairs, strengthen their sense of well-being and ethical standards, and find personal happiness while avoiding extremism and religious discrimination (Muhumuza. N, 2018). It also helps individuals comprehend the world, reflect on their acts, make difficult judgments, and learn what God's will is for their lives. Additionally, religious education can aid in classroom discipline and reduce "juvenile delinquency" within families (Ndugwa. I, 2015).

RECOMMENDATIONS

The study arrived at the following conclusions based on the findings;
For students to develop their ideas, values, and identities, the MoES ought to put an environment where RE instruction provides them with systematic information and comprehension of a variety of faiths and beliefs. This can be done by requesting the curriculum developers to include moral education in the curriculum design., since it enables learners to develop a strong sense of wrong and right, they become responsible, develop empathy, respect for others and self and also have a positive outlook of life.

Foundation bodies of schools should ensure that students' propensity for discussion is fostered for them to become religiously literate and actively contribute to our multi-religious society. The management of schools should set policies that ensure that students acquire and use the knowledge and abilities necessary to comprehend, interpret, and assess texts, authorities, and other types of evidence. This can be achieved by empowering religious people like chaplains for spiritual development among students. This can also be fostered through religious clubs like YCS, Legion of Mary, Xaverian movement, all of which instil the fear of God in the students.

The inter-religious Christian council should encourage the Uganda Bible Society to deliver Bibles to schools and any other useful materials that can be of great help in shaping the spiritual life of students. This can be engineered by the religious leaders on the grassroots like the chairpersons of the MOTHERS Union and Fathers Union, students can also be shown the life of Jesus through videos which increases their sympathy and empathy. Schools can also organize prayers where students can be given spiritual nourishment, for example, catholic founded schools have a mass every week without fail on gazetted day.

Through the world vision whose mission is to is to follow the Lord and Savior Jesus in working with the poor and oppressed, by providing education, basic primary health care, vocational skills, sanitation and hygiene, and livelihood' of all students. This can be beefed up by compassion international whose mission is in line with those of world vision.

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