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CONTENTS

Discursive Construction of External School Quality Assurance Policy Actors' Power in Selected Secondary Schools in Tanzania

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Abstract
In 2017, the School Quality Assurance (SQA) policy was adopted and implemented in secondary schools in Tanzania. Since the beginning of its implementation to date, not much is known about how SQA policy discourses construct external SQA policy actors' power versus internal SQA policy actors. This study analyzed how SQA policy discourses discursively construct external SQA policy actors' power in selected secondary schools in Tanzania. Since policies are implemented through the production, distribution, and consumption of texts and discourses, the study was mainly based on textual and discourse analyses. Findings indicate that SQA policy discourses reconstructed the power of external SQA policy actors rather than the internal SQA policy actors and stakeholders. It is argued that by empowering external SQA policy actors, SQA policy implementation becomes more or less the same as school inspection. It is recommended that an effective SQA policy implementation needs to empower internal SQA policy actors because they interact daily with teachers and students to improve teaching and learning, curriculum, school leadership, school environment, and community engagement.

Keywords: *School Quality Assurance Policy, Power, Policy Actors, Secondary Schools, Discourse*

INTRODUCTION

School supervision system for quality improvement began in Western Europe at the end of the 18th century and sparked to other countries after

the establishment of public schools. In those days, it was considered an essential tool to ensure that all education staff operated in the same rules and regulations and followed a similar programme (De Grauwe, 2007).

School inspection is vital as a means of monitoring teaching and learning by adhering to the stipulated curriculum and set standards (MoEC, 1995). Tanzania inherited the school inspection policy from the colonial rule. After independence, school inspection was sustained to improve the quality of education. Before the 1990s, the policy was faced with inadequate competent personnel; shortage of transport, offices, equipment, and housing; and inspectors' inability to take appropriate and immediate corrective measures where necessary (MoEC, 1995). Efforts were made to strengthen it through Education and Training Policy (ETP) adopted in 1995 because of emphasis on education decentralisation and liberalisation policies that required closer monitoring of schools as well as horizontal feedback mechanisms between the inspectors and education agencies, managers and administrators at zonal, regional and district levels.

Despite the efforts made since 1995, school inspection continued to be less effective due to factors similar to those mentioned above, especially those related to human and financial resources (MoEVT, 2014). Another major weakness of school inspection was the emphasis on centralization where the inspection reports were disseminated to a few actors, including the Commissioner for Education as required by the law (URT, 2002). In addition, school inspectors concentrated on identification of schools and teachers' strengths and limitations in teaching and learning (Matete, 2021). As such, school inspection struggles for power were high between school inspectors who had legal powers, and teachers who had professional powers. By 2010, school inspection was severely criticized, not only in Tanzania, but also in many other countries like Ghana, Indonesia, Kenya, Namibia, and Uganda (Matete, 2021).

With such limitations, the inspection system needed reforms in its organization, purpose, and processes. There was also a need for more stakeholder involvement and alternative techniques (MoEVT, 2014). Thus, transformation from school inspection to School Quality Assurance (SQA) was stated clearly in the ETP issued in 2014. Emphasis was put on reviewing, renaming, and resourcing the School Inspectorate into SQA to ensure quality education provision in accordance with policies, standards,

and procedures. The actual SQA policy was issued in 2017 together with three SQA policy documents, namely: School Quality Assurance Handbook (SQAH) (MoEST, 2017a), School Quality Assurance Framework (SQAF) (MoEST, 2017b), and Guideline for Ward Education Officers (MoEST, 2017c).

SQA policy emphasized on broadening the structure, scope, and core functions of SQA to include grassroot level actors such as Ward Education Officers (WEOs), heads of school (HoS), teachers, parents, and community as stated:

> *The desire to provide holistic and collaborative approach on quality education prompted the Ministry of Education, Science and Technology (MoEST) to shift from the previous system of inspection to a School Quality Assurance System (SQAS) using the Whole School Approach (WSA) involving various stakeholders, including members of the community* (MoEST, 2017b, p. iii).

Such emphasis aimed to improve the SQA processes as well as school management and administration by empowering school boards, HoS, and parents instead of school inspectors who were far from the schools. Education policymakers believed that such reforms would improve accountability and quality control in schools. However, the reforms continued to be top-down and government-directed, aiming at improving school functioning and education practices from the top, an approach that has been inefficient in education services provision in Tanzania (Matete, 2021).

SQA policy implementation was to be guided by what was called SQA principles and procedures which included "strengthening Quality Assurance System (QAS); improving resources (supply of inputs, adequate human, fiscal and material resources); improving the quality of teaching and learning; improving transparency and accountability; and strengthening community engagement" (MoEST, 2017b, p. 6). Based on these principles and procedures, SQA policy implementation involved internal and external policy actors. Internally, there were considered to include internal school quality assurance team (IQAT), school managers and administrators, and teachers. On the other hand, external actors were district education officers, School Quality Assurance Officers (SQAOs), and WEOs.

Since the adoption of the SQA policy in 2017 in secondary schools, not much is known about how SQA policy discourses construct external SQA policy actors' power versus internal SQA policy actors. The purpose of this study was to critically analyse the distribution of power among policy actors in the implementation of SQA policy reform in secondary schools.

Conceptualizing School Quality Assurance as Supervision

SQA can be conceptualized as a process that involves both supervision and counselling tasks (Corey et al., 2020; Glanz & Zepeda, 2015; Sullivan & Glanz, 2013). Supervision is understood as "the process of engaging teachers in instructional dialogue for the purpose of improving teaching and increasing student achievement (Sullivan & Glanz, 2013, p. 24). As such, supervision deals with stimulating, coordinating and guiding the constant teachers' growth, both as individuals and groups, to improve an effective instructional performance (Glanz & Zepeda, 2015).

In conceptualizing SQA as a form of supervision, there are multiple and complex roles and responsibilities of supervisors. For example, according to Corey et al (2020), these multiple roles are teaching or coaching, mentoring, consulting, and counselling. Others are advising, administrating, evaluating, recording and documenting, empowering, and advocating. Some of these functions are described as follows: A supervisor as a teacher has the task of "assigning readings, suggesting a literature search on a specific topic, offering suggestions for attending workshops, and discussing with the supervisee any number of related topics." (p. 23). As a coacher, a supervisor has to instruct, demonstrate, model, guide, and provide positive and negative feedback, and suggest strategies. As a mentoring process, supervision involves two people working in a similar task-the mentor and mentee. The former is a more experienced person and plays the role of providing knowledge, advising, counselling, challenging, and supporting the later to develop experience as a professional.

As counselling, supervision helps the supervisee to develop professionally. However, this process cannot be conducted exclusively to avoid the personal concerns of the supervisee because it is difficult to separate personal from professional and they affect each other. The supervisor has to help the supervisee deal with issues of personal strengths and weaknesses as they relate to the supervisee's practice as a clinician (Holloway, 2016).

As administrators, supervisors provide services required by supervisees as guided by policies and procedures for the organization, licensing body, or professional association (Glanz & Zepeda, 2015). Service provisions are also guided by laws, regulations, and ethics that supervisees must follow in performing their work. As evaluators, supervisors monitor and evaluate the supervisees and provide that information on performance and personal behaviour of the supervisees to such organs as the licensing boards, professional associations, universities, and prospective employers (Corey et al, 2020).

As recorders and documenters, supervisors record and document the events happening in all supervisory sessions in order to protect both the supervisee and the supervisor (Holloway, 2016). All issues raised during supervision sessions are recorded and documented for future references. As empowerers, supervisors empower the supervisee by developing their ability and authority to perform their professional responsibilities (Glanz & Zepeda, 2015). Finally, as advocates, supervisors develop their clients' welfare by teaching them various skills which would enable supervisees to practise their work effectively and efficiently.

Based on these explanations, it seems that: First, effective SQA as supervision is an intervention that takes place on a daily basis. Second, SQA has to focus on improving working relationships as well as teaching and learning processes. Third, the aim of SQA is to enable the growth of teachers and students who are the major players in improving teaching and learning processes. Fourth, supervision involves the supervisor and supervisee with the former having more professional knowledge that the later. Fifth, supervision evaluates and monitors the process of teaching and learning as well as other processes that are geared towards improving teaching and learning.

Similarly, Milne and Reiser (2012) and Milne (2009) support what they call evidence-based clinical supervision model. This model states that supervisees' professional practice can be improved by the supervisor helping them to experience, reflect, conceptualize, plan, and experiment their practices based on the available research evidence, and supervisees' values and preferences. Thus, SQA practices need to rely on the best available research-based evidence.

The Political Model of School Quality Assurance Policy Implementation

The implementation of SQA policy in educational institutions involves a complex interplay of power dynamics and political processes, as highlighted by various scholars in the field. The political model, as discussed by Ball (2012a) and Bush (2020), provides a useful framework for understanding the nature of policy implementation within schools. According to this model, the entire process of education policy, including SQA policies, is inherently political due to the negotiation and bargaining that takes place among various interest groups within the educational system.

Political model of policy implementation focuses on the distribution of power and influence among different actors within schools. This model emphasizes the role of bargaining and negotiation between these actors, leading to the formation of interest groups and alliances that work towards specific policy objectives. However, as power accumulates within dominant coalitions, conflicts naturally arise (Bush, 2020). This viewpoint underscores that educational policy processes are not simply neutral or technocratic endeavors but are shaped by power struggles and differing interests.

Fowler (2014) further strengthens the link between power and educational policy, asserting that power is inherently intertwined with the outcomes of policy processes. This is particularly relevant in schools where power relations are institutionalized, and school administrators wield power through their organizational positions. In the context of SQA policy implementation, school administrators engage with various influential individuals and groups, such as teachers, parents, students, local authorities, and education officers. The interactions between these stakeholders can lead to tensions and struggles over control, resources, and influence in the policy implementation process.

These power dynamics can manifest in micropolitical struggles, a concept highlighted by Ball (2012b) and Lindle (2020). Micropolitics refer to the use of power by individuals to influence others and protect their interests within their daily work routines. This exercise of power can lead to both conflicts and cooperation among individuals as they vie for desired outcomes. The education policy implementation process is inevitably colored by these micropolitical struggles, as each group seeks to maintain

and enhance their power and resources, thus shaping their identity and interests.

Decisions made within schools can trigger micropolitical struggles. Lindle (2020) identifies a range of decisions, from formal policy implementation to resource allocation, that can lead to conflicts due to limited resources or differing priorities. Hinnant-Crawford (2016) underscores the significant influence of teachers on policy implementation within classrooms, staff rooms, and the broader school environment. Teachers' interactions with students, families, and colleagues are shaped by their power and influence, further underscoring their role in policy enactment.

To improve policy implementation, a focus on teachers and students is crucial. Effective education policies should place teachers and students at the center of the process, acknowledging their influence and impact on policy outcomes. Studies on school inspection (Kambuga & Dadi, 2015; Kosia & Lyamtane, 2018; Matete, 2021) have revealed that traditional approaches, such as periodic visits by school inspectors, have had limited success in enhancing the quality of teaching and learning. This underscores the need for a more inclusive and collaborative approach that considers the perspectives and insights of those directly involved in the educational process.

In conclusion, the implementation of SQA policies in schools is a highly political process involving bargaining, negotiation, and power struggles among various stakeholders. The political model, as outlined by Ball and Bush, provides a framework for understanding these dynamics. Power relations, institutionalized within schools, shape policy outcomes, and micropolitical struggles further influence the implementation process. Teachers and students play significant roles in policy enactment, necessitating their inclusion in policy development and implementation. To enhance policy outcomes, a shift towards more inclusive and collaborative approaches, considering the intricate power dynamics within schools, is vital.

THEORETICAL FRAMEWORK

Understanding SQA policy implementation requires a review of theoretical studies on education policy analysis. One of the recent theories in education policy analysis is Critical Discourse Analysis (CDA)

(Fairclough, 2015). CDA is a theory and method of analysing the ways in which individuals and institutions use language to achieve particular ends (Fairclough, 2015). CDA examines how social structures and power inequities are historically and discursively reproduced through oral, written, visual and or multimodal texts. Thus, CDA is critical for exposing the hidden power relations reproduced through the SQA policy discourses and texts. Such hidden power relations are important to understand because they construct political struggles during SQA policy implementation. For Fairclough (2015), these can be critically analyzed by examining the relationship between language and social practice which consider every instance of language use as a communicative event consisting of three interrelated dimensions and procedural stages for analysis which are text, a discursive practice, and social practice.

In the first dimension, the SQA policy discourses and texts were analyzed for their forms and meanings to discern the embedded social power relations, hegemony, ideologies, beliefs, and perceptions that define the third dimension of discourse as social practice. Fairclough argues that text analysis focuses on four main aspects: vocabulary, grammar, cohesion, and text structure.

The second dimension is the analysis of discursive practice which deals with the processes of SQA policy texts production, distribution and consumption. With its procedural stage of interpretation, analysis informs how the SQA policy discourses position WEOs, SQAOs, teachers, and students. Analysing subject positions determines key elements of discourse that embody certain constraints on content, subjects, and relations, or on experiential, expressive and relational meanings. Analysis involves answering the questions: "what is going on?" Which determines the "content", "who is involved?" which determines the "subject", and "in what relations?" which determines the nature of the relationships among social subjects (Fairclough, 2015).

The third analytic dimension is discourse as social practice, which assumes that in the social world, individuals, groups, and institutions are involved in political, social, cultural, and economic activities reshaped by power and hegemonic relations produced and reproduced through discourses. This dimension corresponds to the procedural stage of explanation which deals with the ways in which discourse produces, and is reproduced by, social structures of power relations and social struggles,

which may either sustain or change these relations and struggles. This study intended to analyse how SQA policy discourses discursively construct external SQA policy actors' power as compared to internal SQA policy actors in selected secondary schools in Tanzania.

METHODOLOGY

This study adopted a qualitative research approach guided by social constructionism philosophy (Lock & Strong, 2010). This study was guided by the assumptions that SQA policy discourses are constructive and constitutive of social subjects, relations, and objects. Seven schools located in Kongwa, Chemba, Chamwino and Dodoma Councils within Dodoma region, were purposively selected to make a case study for deeper understanding of the SQA policy implementation. These councils had schools involved in the SQA policy piloting stage for school self-evaluation between 2015 and 2019.

The participants were selected through purposive and maximum variation sampling based on their involvement and experiences in the implementation of SQA policy. Purposive sampling enabled to obtain information from four Heads of Schools, five SQAOs, three WEOs, and three subject teachers by virtue of their positions and experiences with SQA policy implementation. The use of maximum variation sampling helped the development of diverse responses and expands representation.

Data were generated through face-to-face interviews and review of policy documents. Face-to-face interviews were conducted with Heads of Schools, SQAOs, WEOs, and School Board members. Documents collected and analysed included SQA reports, school Quality Assurance Handbook (SQAH), School Quality Assurance Framework (SQAF), and WEO guidelines. The use of these two data collection methods helped the triangulation of data to obtain more authentic findings across data sets and thus reduced the impact of potential bias that could occur.

Data were analysed through thematic and CDA methods. Thematic analysis started with transcription of audio-recorded interviews to develop transcripts of qualitative data and reduce them to specifically interpretable themes and sub-themes. Transcription was followed by coding of transcripts according to categories that coincided with the major question. CDA was guided by three stages of description, interpretation, and explanation (Fairclough, 2015).

FINDINGS

It was found that despite the emphasis on transformation from school inspection to SQA, there was unequal distribution of power between the external and internal school quality assurers. For instance, external school quality assurers (the WEOs and SQAOs) were more empowered than internal school quality assurers and other stakeholders such as subject teachers, heads of schools, school management committees, heads of subject departments, and the Internal School Quality Assurance Team (IQAT). Findings on how external school quality assurers were empowered over internal school quality assurers and other stakeholders are presented in the subsequent sections.

The Empowerment of Ward Education Officers

Data analysis generated ten discourses that were constructed to empower WEOs. The discourses are as described hereunder:

The discourse of academic qualifications and teaching experience

The SQA policy discourses emphasized the minimum qualifications and experience that one had to possess to become WEO. The minimum qualification was a Bachelor's degree or above and must have worked as a teacher for at least seven years. Additionally, they had to show managerial competencies, as emphasized:

> *Competence in teaching; adhering to ethical and teachers' code of conduct guide; have experience in managerial position such as being a head teacher, or deputy head teacher or academic master/mistress; having at least seven years of experience in teaching; showing some managerial competencies like communication and interpersonal skills, report writing and planning* (MoEST, 2017b, p. 21).

In practice, the challenge with these qualifications was that even HoS and teachers supervised by WEOs have similar qualifications. It was found that the WEOs who supervised the schools did not meet all these qualifications as reported:

> *Unfortunately, most WEOs I know have first degree and very few have Master's degree in education. You can't find many of those with higher qualifications. Even in terms of code of conduct, it is difficult to easily trace and know someone's background in terms of ethical conduct. So, it means it is difficult to ascertain all those requirements. They are just written. You can easily identify the educational levels but not the ethical*

> *conduct. It is also difficult to find those with at least seven years of working experience* (Interview with WEO).

As stated by this respondent, the challenge in practice was the difficulties involved in to tracing someone's background information that would tell his or her ethical conduct.

Revision of position nomenclature from Ward Education Coordinators (WECs) to WEOs

It was also found that transition from school inspection to SQA required the revision of the nomenclature of the position of WECs to WEOs which was defined through the 2014 ETP, which states:

> *The implementation of Education and Training Policy shall be managed by the Ward Education Officer who shall be the coordinator for the implementation of Education and Training Policy for government and private schools at the level of pre-primary and basic education, secondary education, adult education and non-formal education. Ward Education Officer shall also be an inspector for the nearby schools in their ward and shall be accountable to the District Education Officer* (MoEVT, 2014, p. 66).

The quotation above shows that with the adoption of SQA policy, the tasks of WEOs were expanded to supervising both primary and secondary schools located in their wards. However, WEOs' position was not supported by the existing Education Act 1978 since the amendments were not done.

The discourse of "I" and "my"

The WEOs were also empowered by reconstructing some knowledge, beliefs, and attitudes towards their work through the frequent use of the pronouns "I", and "my" throughout the Guidelines for their work (See p. 1, 3, 14, 15, 31). For example:

> *I have an important part to play in reinforcing the drive for school quality. I am an agent for continuous school improvement, because I am close to schools. I know them well through frequent visits and have close working relations with the HoS, teaching staff, School Committees and communities. While SQAOs have only intermittent contact with schools, I provide close-to-school support on an on-going basis.* (MoEST, 2017c, p. 7).

The personal pronouns "I" and "My" represent loyalty, integrity, commitment, views, and personal perceptions of the speaker. These pronouns empowered WEOs with knowledge, beliefs, and attitudes relevant in the SQA process. In terms of knowledge, WEOs were made to believe, think, and act to serve the interests of SQA policy, such as the knowledge and beliefs on the government policy transformation from school inspection to SQA. Moreover, such pronouns were manipulative and were used by SQA policymakers to indicate, designate, and identify WEO's responsibilities in the policy implementation. In addition, such pronouns persuaded other policy actors to enhance good relationship that would facilitate sharing those responsibilities through collaboration that enhances team work in the policy implementation. Further, they were also used to construct WEOs' identity by creating positive impressions and commitment from heads of schools, SQAOs, teachers, and other actors at the LGA.

The discourse of supporting SQA visits

WEOs were also required to support SQA visits by performing eight roles and responsibilities which were called "steps". These steps included:

Step 1: Pass on to the school the formal notification of an SQA visit
Step 2: Distribute SSEF (school self-evaluation forms) and provide guidance on how to fill in SSEF
Step 3: Receive the SSEF from the school
Step 4: Uploading the SSEF on the Accreditation and Quality Assurance Database
Step 5: The on-site visit by the SQAOs
Step 6: Final Report and School report card
Step 7: Follow-up immediately after an SQA report is received
Step 8: Follow up on recommendations and provide continued support (MoEST, 2017c, p. 31-32).

By performing those roles and responsibilities, the WEOs were empowered over other policy actors and stakeholders in the policy implementation process. These steps were considered relevant for supporting the preparation of SQA visit.

The discourse of influencing learner's achievement

Through the discourses of "My role in relation to learner's achievement", the WEOs were empowered to support internal quality assurers by encouraging schools to keep up-to-date records of learners' achievement

in the form of regular classroom assessment as well as formal examination results. The excerpt below illustrates this finding:

> *Teachers need to know how their children are progressing to determine their teaching strategies. I support the HoS and the internal quality assurance team to ensure that this is happening. This involves encouraging schools to keep up-to-date records of learners' achievement, in the form of regular classroom assessments as well as formal examination results.* (MoEST, 2017c, p. 20).

From the exact above it means SQA policy empowered WEOs to influence learners' achievement by supporting teachers and the school management to keep and submit regularly summarized data on students' assessment and examination results to the district as well as useful management information data for allocating resources for school functioning. WEOs were also required to ensure information accuracy.

The discourse of influencing the quality of teaching for good learning and assessment

Through the discourse of influencing "the quality of teaching for good learning and assessment" (MoEST, 2017c, p. 21), the WEOs were empowered to encourage classroom observation and feedback among heads of schools and IQAT. Classroom observations was framed such that teachers were observed like objects presupposing that they lack subject matter and pedagogic knowledge. Additionally, the WEOs were empowered to evaluate heads of schools' ability to evaluate lessons by conducting joint classroom observation. This joint observation reconstructed the WEO's power and heads of schools' knowledge of effective teaching, and the ability to conduct quality lesson observations and provide feedback; and develop teachers' competencies in schools.

The discourse of supporting the quality of the curriculum in meeting learner's needs

Through the discourses of supporting "the quality of the curriculum in meeting learner's needs" (MoEST, 2017c, p. 24), the WEOs were empowered through ensuring the availability of the latest curriculum documents to HoS and teachers; developing teachers' awareness of curriculum changes; ensuring that schools provide for all aspects of the curriculum. Others are ensuring the identification of the curriculum contents that teachers find difficult, and ensuring that teacher professional development activities were designed around those contents. Also, they

were empowered to emphasize the role of literacy and numeracy and knowledge of language or science.

The discourse of developing the quality of leadership and management

Through the discourses of "How I develop the quality of leadership and management' (MoEST, 2017c, p. 25), WEOs were empowered to influence school development planning by understanding and communicating the purpose, steps and responsibilities in school self-evaluation and school development planning. They also influenced professional leadership by assisting school leaders to lead "the teaching process and managing the teaching force in their schools through clear goals and expectations about teacher performance; and influence financial management by ensuring that schools follow correct financial procedures for holding, spending and accounting for funds" (p. 25).

The discourse of affecting the quality of the school environment and its impact on welfare, health and safety

Through the discourse of "How I affect the quality of the school environment and its impact on welfare, health and safety" (MoEST, 2017c, p. 28), WEOs were empowered to make frequent and regular visits in schools. Through these visits, the WEOs were expected to develop knowledge of the school atmosphere in terms of its neatness, tidiness, and learners' happiness or if it had scaring atmosphere with teacher absenteeism and classroom attendance, students' misbehaviour and sadness. All such practices ensure that schools had physical, emotional and moral environment which supports learning.

The discourse of influencing community engagement

Through the discourse of "My role in community engagement" (MoEST, 2017c, p. 26), the power of WEOs was reconstructed by emphasizing them to take a unique position in establishing good relations between the school and the community. This was supported by an interviewed WEO:

> *Our focus is also on ensuring that the involvement of parents and the community in monitoring student learning takes place. This is largely a factor and that is why even during the inspection, SQAO have to involve various groups to gain a common understanding including parents, school boards and even students themselves. This is different from what it was during the inspection policy.* (Interview with WEO).

Community engagement was enhanced by the WEOs by making regular visits to the schools to discuss with the HoS about community-related issues. They also had power to meet school board members by attending board meetings as scheduled and provide feedback to the HoS. They also encouraged schools to communicate with parents and the wider communities through the use of school notice boards.

The Empowerment of School Quality Assurance Officers

Data analysis resulted in the development of nine themes which we refer them as discourses. They are: academic qualifications and experience; signing the code of conduct; SQA pre-visit preparation; On-site visit; meeting with school leadership and reporting to higher levels; focus group discussion with parents; focus group discussion with staff; talking to learners; and preparing the Final SQA Report and School Summary Report. Each is discussed as follows:

The discourse of academic qualifications and experience

The "qualifications" discourse required SQAOs to possess a "Bachelor's Degree with Education, and above coupled with classroom teaching experience of not less than ten (10) years." (MoEST, 2017b, p. 21). However, the recommended qualifications may be considered inadequate for effective SQA process and practices because many secondary school teachers and heads hold similar qualifications. Hierarchically, the SQAOs may need to possess higher academic qualifications for their supervisory effectiveness.

The discourse of signing the code of conduct

SQAOs were also empowered by "signing the Code of Conduct" which was framed by using the discourse of "I will" (MoEST, 2017a, p. 6). This discourse constructed loyalty, integrity, commitment, and involvement in their responsibilities and accountability in policy implementation. This finding is demonstrated in the following excerpt:

> *The Code of Conduct is essential to ensuring that the core values are in place and are visible in practice. All SQAOs will sign the Code of Conduct before undertaking any whole-school visits. This means that everyone will be committed to demonstrating professional and respectful behaviour and communication at all times.* (MoEST, 2017a, p. 6).

However, the weakness of this empowerment is that policymakers constructed objectivity in SQA process by assuming that any SQAO who

work based on the codes will be fair, impartial, respectful, confident, able to plan and manage, communicate, and provide feedback. This assumed objectivity may be difficult since SQAOs are human beings with their own motives, objectives, interests, knowledge, background, and motivation.

The discourse SQA pre-visit preparation

The discourse of SQA pre-visit preparation empowered SQAOs by reshaping WEOs to support SQA visits. WEOs were required to make "preparations and procedures prior to a SQA visit by the SQAOs" and make "follow-up and on-going support following a SQA visit" (MoEST, 2017c, p. 30). These two roles were to be attended by performing eight roles and responsibilities as illustrated above. By performing those roles and responsibilities, WEOs empowered SQAOs than other policy actors in the policy implementation process. Moreover, the SQA policy empowers SQAOs to use "information provided by the school to prepare" (MoEST, 2017a, p. 9) for visit, and to "write a short pre-visit plan (PVP) to share with the team members electronically in advance of the visit" (p. 9). This practice still constructs unequal power distribution between the SQAOs, WEOs, and other SQA policy actors.

The discourse of "on-site visit"

Through the discourse of "on-site visit", SQAOs were empowered to visit, observe, and report classroom teaching and learning to enhance the overall quality of the school. This is demonstrated as follows:

> *The SQAO team will engage in a range of activities in order to gain a full and accurate picture of how well the school is functioning. In addition to the documentation and supporting evidence provided by the school, the SQAO Team will collect evidence through … direct observation of learning and teaching in classrooms and other learning areas* (MoEST, 2017a, p. 10).

This means that during their visits to schools, SQAOs were empowered to observe, collect evidence, and report for feedback on the impact of school leadership and management, the curriculum, and the school environment. These discursive practices reproduced the power of SQAOs over school management, administrators, teachers, and students because the role of all these stakeholders in the observation of classroom teaching and learning is not emphasized by the policy.

The discourse of meeting with school leadership and report to higher levels

During the school visits, SQAOs were empowered to meet with the school leaders and managers and report the findings to higher levels as illustrated:

> *Meetings with the HoS and other school leaders, such as specialist staff, academic leads, and Heads of Departments provide valuable evidence on the quality of leadership and management. During these meetings, SQAOs will ask key questions linked to the Domains, focus areas for follow up from the SSEF, or to better understand learner attainment data. In order to have a full picture of the quality and impact of leadership and management on the school and community, the SQA team leader will also arrange to meet with members of the SMC/SB [School Management Committee/School Board.* (MoEST, 2017a, p. 15).

This discursive framing empowered SQAOs to any ask questions related to the SQA domains. The role of the school managers and administrators in the meeting is not defined. This means that the school managers and leaders are positioned as passive providers of answers to questions and data required by SQAOs. This framing means that the SQAOs dominated the meeting which becomes the site for the production and reproduction of their power over the school managers, leaders, administrators.

The discourse of focus group discussion with parents

The discourse of "focus group discussion with parents" (MoEST, 2017a, p. 15) also empowered the SQAOs because they led, moderated, and reported the discussion. Parents' role in the FGD was not explicitly stated. Instead, the discussion was required to "align with the SSEF, Domains, and the Quality Indicators" (p. 15). Parents' active participation in the proposed FDG would be determined by their knowledge of SSEF, Domains, the quality indicators; their educational level; awareness with school activities; and full involvement in SSE. However, this is not the case because all parents who were interviewed had no idea of SSE, its role, and how it was used in the school as supported by a parent:

> *We really know nothing about the existence of SQA. We know there is school inspection where the school inspectors come and inspect the school. The school inspectors have not engaged us in their work; we only know their existence through parents' meetings where we are told they came and suggested so and so.* (Interviewed Parent).

The discourse of focus group discussion with staff

The discourse of "focus group discussion with staff" (MoEST, 2017a, p. 15) was also empowered the SQAOs and not staff because the former determined who would be the invited staff, the number, what would be discussed, and how it would be discussed. The discussion was to align with the SSEF, domains, and quality indicators. This framing limited invited staff to expose their fellow staff or bosses' weaknesses as supported by one teacher:

> *There is no good way of giving oral feedback after the inspection as all teachers are invited together with school officials. The SQAO begins to explain our weaknesses. You will be surprised to find even administrative issues being discussed in the presence of all teachers. We think this is really awkward.* (Interviewed Subject Teacher)

In such circumstances, it is unlikely that invited staff would freely talk on the weaknesses of the individuals in the school community. Such discussions will likely on reporting shortage of textbooks, teachers, classrooms, large class sizes, and or poor students' participation.

The discourse of talking to learners

The discourse of "talking to learners" (MoEST, 2017a, p. 13) empowered the SQAOs to determine what, how, and when to talk with learners in classrooms. It was expected that students would be free to talk in the FGDs with SQAOs matters related to their understanding and attitudes towards teaching and learning. However, since SQAOs were visitors, students' discussion freedom was limited as reported by a teacher during an interview:

> *There is a requirement in quality assurance that students sit together with the SQAOs for them to provide feedback related to teaching and learning. Only few students might have the courage to the visitors. Even at our homes we are not socialized to just talk family issues to a visitor. It can't just happen as expected*. (Interviewed Subject Teacher)

This implies that students had limited freedom to discuss what and how they were taught and evaluated in the presence of their fellow students. Moreover, the effectiveness of the discussion depended on the SQAOs' knowledge, skills, and attitudes to encourage students to talk.

Preparing the Final SQA Report and School Summary Report

SQAOs were empowered to prepare the Final SQA Report and School Summary Report. This is clear in the policy document which states:

> *The SQAOs will use the evidence gathered to make judgments on the quality of the school's work. These will be summarised in written bullets outlining the factors that support learning, the factors that limit effective learning, and recommendations for action for each Domain. These findings are then put together by the SQAO team leader to form a report that provides a comprehensive analysis of the school's strengths and areas for improvement. The findings made by the team are based on the evidence presented and therefore these findings are final. The judgments made in the report cannot be challenged but any factual inaccuracies contained in the report will be addressed.*

From the above statement, in most cases, it is clear that the reports were an outcome of SQAOs' judgments rather than those of other SQA stakeholders because the SQAOs dominated the school visit preparation, classroom observation, and the discussions with school leadership and management, staff, students, and parents. The report cannot be an outcome of the joint efforts between SQAOs, school management, administrators, teachers, students, and parents as planned by the SQA policymakers.

DISCUSSION

The major finding indicates that in the context of education quality improvement, the discourse surrounding SQA policies has resulted in external policy actors such as SQAOs and WEOs gaining more influence than internal policy actors. Despite the intention to transform from school inspection to SQA to empower internal actors, the actual implementation has continued to empower external actors. This is contradictory to the goal of enhancing education quality through empowering internal stakeholders. Furthermore, this contradicts the stated SQA principles, which focus was on improving QAS, transparency and accountability, community engagement, resources, and improving teaching and learning.

The impact of empowering external actors in implementing SQA policies can be understood by using the concept of power, domination, and control, as discussed by Fairclough (2015), Foucault (1978), and Fowler et al., (2019). These theorists emphasize that power dynamics are central, with powerful participants in discourses exerting control over the contributions of less powerful participants. This control over discourse leads to limitations in the scope of content, affecting knowledge, beliefs, social relations, and subject identities. Foucault's (1980) concept of power/knowledge further supports this idea, highlighting the connection

between language, knowledge, and power. He argues that those who control discourse also control what can be known, influencing ideologies, beliefs, and identity. In essence, Foucault contends that language and knowledge are inherently political.

Thus, as the findings have shown, in the context of SQA policy implementation, WEOs and SQAOs controlled school leaders, school boards, teachers, students, and parents. That is, they determined their knowledge, power, and identity in SQA processes and practices. As such, SQA does not differ from school inspection that failed to improve quality of teaching and learning in schools (Kambuga & Dadi, 2015; Matete, 2021; Kosia & Lyamtane, 2018). For example, in improving the quality of school leadership and management as quality component, the process was framed in ways that empowered WEOs and SQAOs to evaluate school leaders as they lead learning and people, and manage resources. The opportunity for school leaders to share their leadership experiences, opinions, views, and discuss with the SQAOs and WEOs to arrive at a consensus in school leadership and management decisions was constrained because school leadership practices were evaluated without leaders' voices. In other words, the school leaders were considered as tabularasa and thus disempowered. The discussion between the external policy actors and the school leaders is inevitable which could have allowed power sharing. Without power sharing it is difficult for the SQAOs and WEOs to conduct objective evaluation of the school leaders' performance as an input to SQA process.

Similarly, in the classroom visits and observation, external policy actors were empowered than school managers, leaders, teachers, and students because their roles in the classroom observation was not emphasized. Teachers and students who are the major players in teaching and learning game, were positioned as passive cogs to be visited, observed, and reported without their voices. Moreover, they were also positioned as passive feedback recipients and providers of evidence on the impact of school leadership and management, the curriculum, and the school environment on the quality of teaching and learning. SQA policymakers assumed that SQAOs and WEOs can visit and observe classrooms and obtain all the information they wanted without engagement of the school management, administrators, teachers, and students.

Considering SQA as supervision and counselling as rightly advocated by Corey et al. (2020), the empowerment of WEOs, the so-called "close-to-school supervisors", is difficult to improve quality because the policy implementation misses the elements of both practising supervision and counselling. It misses supervisory elements because the SQAOs, WEOs, IQAT, and most school heads, lacked the skills for practising supervision which were necessary for effective supervision of others in a variety of school or educational settings (Corey et al. 2020). Effective SQA need to involve daily interaction with teachers and students which need to be done by heads of school and departments rather than WEOs and SQAOs.

Considering supervision as teaching, the way the SQA was practised constrained the supervisors to perform the teacher's role and the more reliance on outside visitors constrains coaching, instructing, demonstration, modelling, guiding, and providing feedback on proper strategies. It constrained discussing teachers' fears, hopes, frustrations, or professional training requirement.

The empowerment of external as opposed to internal policy actors also constrains the provision of advice because of power relationship between the two. SQAOs gave more orders rather than providing advice. As advisers, supervisors have to empower supervisees to learn decision making related to professional role performance. Similarly, resource limitations may constrain provision of advisory services by WEOs and SQAOs. Instead, they end up writing reports which sometimes are not accessible (Sullivan & Glanz, 2013).

Moreover, although SQA policy implementation encouraged monitoring and evaluation of teachers' work and school management, it does not fully involve subject teachers as supervisees and students as learners. As supported by Educational Supervision Theory (Sullivan & Glanz, 2013), effective evaluation of teachers as supervisees has to involve monitoring and evaluation. This provides relevant information on their performance and personal behaviour to provide feedback to teacher certification authorities, universities, and employers.

In addition, the current SQA policy implementation needs to rest on the foundations of Evidence-based Clinical Supervision Model (Milne, 2009; Reiser, 2021). This model states that supervisees' professional practice can be improved by the supervisor helping them to experience, reflect,

conceptualize, plan, and experiment their practices based on available research evidence, supervisees' values, and preferences. However, the way SQA was practised in schools relied more on the evidence provided by external policy actors.

The impact of over-empowering external SQA policy actors on the success of the policy implementation may be discussed using the political model which emphasizes the concept of SQA policy empowered external policy actors to dominate internal policy actors. Similar to school inspection, this kind of power is about domination of school boards, school heads, teachers, students, and parents. However, this form of power is likely to produce conflicts, contests, competitions, and resistance (Ball, 2012b, Bush, 2020; Hoyle, 1999; Lindle, 2020, 2014). This is because of the following reasons: First, internal policy actors like school heads and heads of departments also possess positional power which may limit the implementation of what external policy actors want. Second, most external policy actors have similar qualifications with school heads and subject teachers. Teachers' possession of professional power and its impact in the policy implementation is supported by O'Neill (2005). O'Neill argues that teachers can exert considerable influence over education policy at the point of implementation in centres, classrooms, staff rooms and the institution as a whole. Teachers can also influence the nature of the relationships they enjoy with students, families and fellow teachers. This implies that since SQA policy implementation does not recognize teachers' power by constraining their direct involvement, teachers may resist, either passively or actively, and constrain the achievement of policy objectives. An effective SQA policy must put teachers and students at the centre of the implementation process. Third, external policy actors were just visitors to the schools and they lacked resources to implement the functions or powers provided in and through the policy.

Like during the school inspection era, during the SQA era struggles also emerge between external policy actors and teachers because teachers have professional power based on their knowledge and skills constructed in and through short and long-term professional training, as well as teaching experiences (Gonzales, 2019; Sorm & Gunbayi, 2018). For example, conflicts may emerge in the process of SSE and SQA visits between the personalities involved. However, SQA policymakers do not recognize the impact of such politics and assume that schools can be evaluated using

the rigid guidelines provided at the national level. Further, they consider SQA processes as being linear and objective.

CONCLUSION AND RECOMMENDATIONS

Based on the study findings, it can be concluded that the SQA policy discourses still empowers much the external policy actors than the internal ones. Moreover, SQA policy implementation is constructed as a linear and objective process as contrasted to the fact that it is actually a complex and subjective undertaking. As such, it is practically still a replica of school inspection rather than SQA. Putting emphasis on external supervision dominated by WEOs and SQAOs renders it difficult to assure quality teaching and learning and the related processes at school. Besides, since external quality assurers visit schools periodically, it is difficult to bring transformation in the process of ensuring education quality. Given that internal SQA policy actors are disempowered, it means that SQA does not adequately provide information for teacher professional development to improve the quality of schools and that of teaching and learning.

Two recommendations are important. First, there is a need for the Government policymakers to review the current SQA policy to make it empower internal rather than external policy actors. This will make it different from the former school inspection. Second, the revised SQA policy has to focus more on internal supervision rather than visiting schools and classrooms from outside. Further studies might need to be done on the impact of the empowerment of external SQA policy actors and the effectiveness of school self-evaluation.

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Physicochemical Characteristics and Heavy Metal Levels in Groundwater from Selected Areas of Dar Es Salaam City, Tanzania

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Abstract
Groundwater in Temeke and Ilala areas within Dar es Salaam city was analysed for physicochemical characteristics and heavy metal levels to assess its quality as potable water. Random sampling was used to obtain groundwater samples from three sampling sites, namely, residential areas, near petrol stations and dumping sites. Temperature, pH, and electrical conductivity (EC) were measured on-site by a water quality multimeter while heavy metals levels were determined by standard methods using Atomic Absorption Spectroscopy (AAS). Measurement of pH (pH 5.2-7.3) showed that groundwater largely satisfied TBS and WHO standards. Similarly, EC values of groundwater (256.5-5286 µScm-1) largely met TBS specifications while only 33% of groundwater complied with the WHO guidelines. Cd in groundwater from the three sampling sites (0.01-0.50 mgL-1) exceeded TBS and WHO standards. Pb in 89-94% of groundwater collected near petrol stations (0.01-1.10 mgL-1), 80% of groundwater from dumping site (0.01-1.22 mgL-1), and 25%-70% of groundwater from residential areas (0.01-0.65 mgL-1) exceeded the TBS and WHO standards. Cr concentration in 50-66% of groundwater samples collected near petrol stations (0.01-1.1 mgL-1) and 20-42% of groundwater from residential areas (0.01-0.45 mgL-1) exceeded TBS and WHO standards on total Cr. Levels of Cu (0.01-1.70 mgL-1) and Zn (0.01-1.82 mgL-1) were largely within the TBS and WHO standards. Groundwater in the study area is contaminated with non-permissible levels of Cd, Pb and Cr, which makes it unsuitable for human consumption and hence likely to affect public health.

Keywords: *Groundwater, Heavy metal, Physicochemical characteristics, TBS, WHO*

INTRODUCTION

Tanzania depends on both surface and groundwater to meet water demands for its population. Dar es Salaam city, like other metropolis in Tanzania, does not fully meet its water demands partly due to overreliance on surface water sources distributed by the infrastructure-challenged system and ever-rising demand due to rural-urban migration. Water demand for Dar es salaam city with a population of over five million (National Bureau of Statistics, 2018), is estimated at 195.24 million m3/year equivalent to 545,000 m3/day (United Republic of Tanzania, 2017). The actual water supply by the water authority, without considering water loss, is approximately 488,000 m3day-1 (United Republic of Tanzania, 2017) of which 58,000 m3day-1 is groundwater.

According to United Nations (2019) city's population is projected to grow close to 10 million by the year 2030, creating a water demand estimated at 12,000,000 m3day-1. To meet the existing and future demand, groundwater will be increasingly exploited since it is more reliable, resilient to climate change (Lapworth et al., 2013) and closer to consumers. From the aforementioned, it is necessary to monitor the quality of groundwater supplied to city residents in order to protect public health.

Groundwater is affected by geology and geochemistry of the area, climate change and anthropogenic activities including urbanization, industrialization, and landfilling (Brindha and Elango, 2013; Hailu et al., 2017). Several studies (Gonzalez et al., 2012; Balderacchi et al., 2013; Kuroda, et al., 2012) have shown that groundwater contamination is a serious environmental issue and heavy metals should receive particular attention due to bioaccumulation, biomagnification and high toxicity at low concentrations (Mucheweti et al., 2006). While some heavy metals including Fe, Cu, Zn, Ni are essential for proper functioning of biological systems at certain concentrations, exposure to elevated concentrations causes adverse effects on living systems and the environment (Liu et al., 2013). Adverse effects of heavy metals such as Cr, Mn, Fe, Ni, Cu, Zn, As, Al, Cd, Hg and Pb on the environment and living systems including human beings have been well documented (Cambra et al., 1999; Flynn and Haslem, 1995; Hutton and Symon, 1986; Khan et al., 2009; Kisamo, 2003; US EPA; 1983, 1986; Koller et al., 2004; Jomova and Valko, 2010; Borowska and Brzóska 2015). Briefly, adverse effects cover a broad spectrum from short-term exposure leading to dizziness, and irritation to

skin and nose to long-term conditions including cancer, kidney failure and brain damage in children.

The presence of heavy metals in water is widespread in many cities. Mor et al. (2006) showed that dumping sites and automobile garages are considered as some of the largest contributors to heavy metals. Dumping sites are known to introduce inorganic and organic chemical species which ultimately affect the aquatic environment and species which live in such environments (Mushtakova et al., 2005). According to Mato (2003) main sources of groundwater pollution in Dar es Salaam include domestic sewage, industrial effluents, petroleum products dispensing units and solid waste dumping sites. Based on work by Kazuva and Zhang (2019), the city's solid waste generation rate is 0.80 kg/capita/day for a population of 5 million residents (National Bureau of Statistics, 2018). Breeze (2012) estimated only 40% of the solid waste generated in the city is disposed-off, mainly at the Pugu dumping site. The area under study also hosts active urban farming, which may contaminate soil and water sources through inappropriate application of pesticides and the use of poultry manure (Howorth et al., 2001, Ravindran et al., 2017). In addition, the area hosts various industries processing food, textile and plastics (occupying 22% of the total area) which a exert negative impact on the environment.

Most of the groundwater in Dar es Salaam comes from boreholes and wells situated in residential, and commercial premises like petrol stations, industrial or institutional areas, where the ongoing anthropogenic activities are likely to affect water quality. Previous works on groundwater by Nkotagu (1996), Kassenga and Mbuligwe (2009), and Napacho and Manyere (2010) have been confined to biological, pathogenic, and physicochemical (anionic composition) water quality parameters. This work, therefore, reports on heavy metal levels, and some physicochemical characteristics which may influence heavy metals in groundwater. It further compares the metal levels and parameters against TBS and WHO standards to the assess potability of groundwater.

MATERIALS AND METHODS

Study Area

Study area covered the southern and south Eastern parts of Dar es Salaam city, where the two districts, Temeke (-6o52’8.40 S; 39o15’39.60’’E) and Ilala (-6o49’26.40’’S; 39o14’56.40’’E) are located (Figure 1(a)). The

population in the study area, which is approximately 1.4 million residents (National Bureau of Statistics, 2018) is largely dependent on groundwater supply from boreholes and wells owned by DAWASA, a parastatal water supply company (2200 boreholes) and private individuals (1800 wells).

The study area covered several wards including Kurasini and Chang'ombe in Temeke District, and Kisutu, Gerezani, Buguruni, Tabata, Vingunguti, Kipawa, Kitunda, Kiwalani, Ukonga, Segerea and Pugu wards in Ilala District. More wards in Ilala District are covered in this study because it hosts many petrol stations and dumping sites as compared to Temeke District which is mainly a residential area. Tabata dumping site in Tabata ward is a defunct municipal dumping site, which is currently populated with heavy and light engineering service garages. Pugu Kinyamwezi in Pugu ward is an active dumping site for solid waste in the city, which is located 30 km from the city centre.

Sampling and On-site Measurements

In this work, the study area (Figure 1 a) was divided into three main sampling sites: residential areas, areas near petrol stations and areas near solid waste dumping sites. Water samples were collected from a total of 54 randomly selected sampling points; 21, 18 and 15 from residential areas, near petrol stations and dumping sites, respectively. Global Positioning System receiver (Garmin GPS76CS) was used to ensure samples were collected at exactly the same location during dry and rainy seasons.

As shown in Figure 1b, Kurasini and Chang'ombe areas in Temeke District were sampled for water from residential areas (S11, S16- S21) and a few points in areas near petrol stations (PS1, PS2). Buguruni, Gerezani, Vingunguti, Kipawa, Kitunda, Kiwalani, Segerea, Ukonga and Pugu wards provided most of the samples of groundwater from both residential (S1-S15) and petrol stations (PS3-P18).

Six sampling points (D1-D6) from Tabata dumping site (Figure 1c(i)) in Tabata ward and nine sampling points (D7-D15) from Pugu Kinyamwezi dumping site ((Figure 1c(ii)) in Pugu ward provided groundwater from dumping sites. Table 1 shows GPS locations of sampling points in the three sampling sites.

Water was pumped out of boreholes or wells for ten minutes and sample collected in plastic bottles, which had been previously been soaked overnight in 10% HCl and rinsed with milliQ water. The collected samples (500 mL each) were labeled (location, date, time, source) and physicochemical parameters likely to influence metal ion composition i.e. temperature, pH and electrical conductivity (EC) were measured on site using water quality multimeter (Hach Sension 156). Four measurements were taken for each parameter at each sampling point and mean values were calculated.

The water samples were thereafter stored in cold boxes and transported to the Environmental Engineering Laboratory at Ardhi University for metal ion analysis. Samples were collected during the rainy season from March to May (long rains) and October to December (short rains), and during the dry season from January-March and June-October.

Reagents

Hydrochloric acid (ACS reagent 37%) and nitric acid (ACS reagent 70%) were purchased from Sigma Aldrich (St. Louis, MO, USA). All aqueous solutions were prepared in pure 18-MΩ MilliQ water (Millipore SA, Molsheim France), while acetylene and oxygen gas were bought from Tanzania Oxygen Company (Tanzania). Metal standards (1000 ppm) for Cd, Pb, Cr, Cu and Zn were purchased from Hach (Loveland, CO, USA).

Heavy Metals Analysis

Water samples for heavy metals analysis were filtered (Whatman No. 4 filter paper) and preserved with concentrated HNO3 (0.5 mL) to make 500 mL water sample solution. Heavy metal analysis was carried out by Perkin Elmer® Analyst 100 Atomic Absorption Spectrophotometer (AAS), fitted with HGA 850 Graphite Furnace (Perkin Elmer® Germany) and AS 800 Auto-sampler (Perkin Elmer® Germany). For all measurements, a slot burner head (10 cm long), a standard air-acetylene flame and 0.7 nm slit were used. Elements were measured at 228.8 nm, 357.9 nm, 324.8 nm, 283.3 nm and 213.9 nm for Cd, Cr, Cu, Pb and Zn, respectively. Blank sample (500 mL solution containing 0.5 mL concentrated HNO3 acid) was prepared by MilliQ water. Blank and water samples were analyzed directly without any further treatment.

Working standards were prepared by diluting respective metal stock solutions to a lower concentration range (0-10 mgL-1) and the response measured. The calibration curve for each metal was prepared after correcting for blank sample reading. Water samples were finally measured, corrected for blank and concentration established. Four readings were made for each sample.

Quality Control

Sample contamination was controlled during sample collection through rinsing of sample containers (plastic bottles) with the actual sample and transporting the sample in a clean cool box. In order to control contamination of samples during analysis, the samples were directly aspirated from 50 mL beaker, which had been washed by detergent and soaked overnight in a solution containing dil HNO3 acid.

Reliability of results obtained in this work was assured by calculating accuracy and precision. Samples were spiked and recovery test for each metal was done by determining its concentration in a sample before and after adding a known amount of analyte using the equation:

$$\% \text{ Recovery } = \frac{C_a - C_b}{C_s} \times 100$$

where

C_a is the concentration after adding the standard,

C_b is the concentration before adding a standard, C_s is the concentration of the standard added

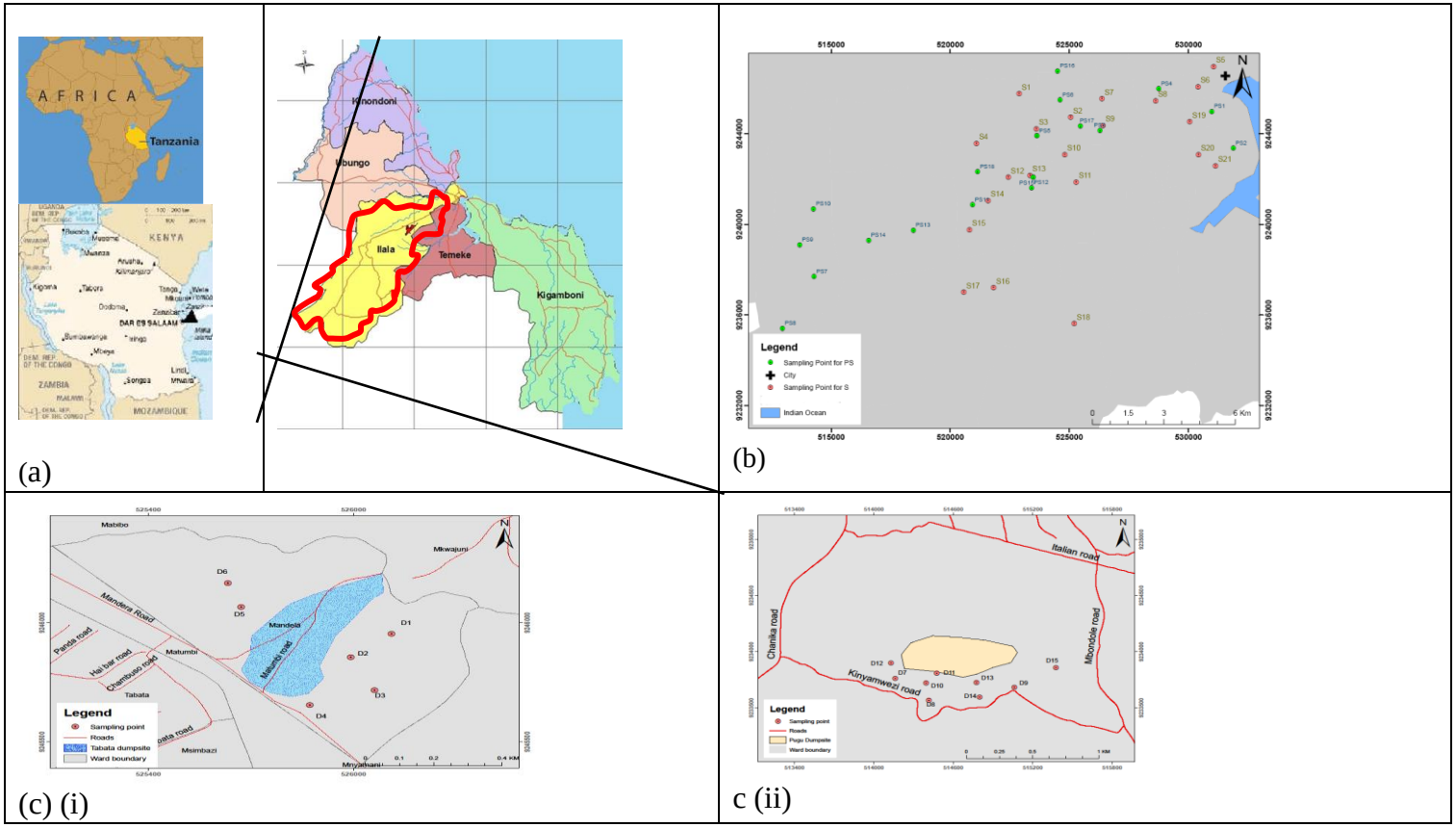

Figure 1: Study area and Sampling sites for groundwater: (a) Study area: parts of Ilala and of Temeke Districts (b) Residential areas and areas near petrol stations (c) (i) Defunct Municipal dumping site at Tabata area (ii) Active municipal dumping site at Pugu area

Table 1: Location of the Sampling Points

Near Petrol Stations			**Near Dumping sites**			**Residential areas**		
Sampling point	Easting	Northing	Sampling point	Easting	Northing	Sampling point	Easting	Northing
PS1	530975.88	9244984.60	D1	0525982	9245589	S1	522893.28	9245769.2
PS2	531877.78	9243361.20	D2	526112	9245915	S2	525052.23	9244729.5
PS3	526286.04	9244142.84	D3	525934	9245762	S3	523614.13	9244226.9
PS4	528751.21	9245986.70	D4	525790	9245723	S4	521102.4	9243576.9
PS5	519231.24	9241517.33	D5	0525690	9245950	S5	531049.61	9246964.7
PS6	522297.67	9250175.67	D6	0525672	9245991	S6	530404.54	9246080.8
PS7	514280.86	9237689.30	D7	513745	9233868	S7	526371.18	9245548.7
PS8	512958.082	9235404.501	D8	514353	9233669	S8	528617.85	9245455.4
PS9	513679.603	9239092.243	D9	514568	9233685	S9	526407.43	9244369.6
PS10	514260.810	9240675.561	D10	514276	9233840	S10	524804.69	9243080.8
PS11	520936	9240858	D11	514395	9233910	S11	525284.75	9241873.9
PS12	523477	9242085	D12	513725	9234051	S12	522433.17	9242073
PS13	518449	9239733	D13	514372	9244582	S13	523341.41	9242163.3
PS14	516573	9239290	D14	514973	923688	S14	521589.74	9241052
PS15	523477	9242085	D15	515040	9233688	S15	520809.21	9239771.2
PS16	524506	9246769				S16	521819.06	9237205.2
PS 17	525500	9244258				S17	520567.28	9237003.5
PS18	521125	9242451				S18	525200	9235619.7
						S19	530051.6	9244536
						S20	530416.5	9243082
						S21	531137.7	9242584

Four measurements were made for each metal and standard deviations were obtained to show precision of the method. As summarized in Table 2, percent recovery, precision and LoD for the heavy metals analysed are within acceptable limits.

Table 2: Recovery of heavy metals in groundwater

Metal	**% Recovery**	**LoD/ 10^{-4} mgL^{-1}**
Cd	96±1.1	5.50
Pb	99±1.3	5.49
Cr	97±1.2	5.48
Cu	107±2.8	5.49
Zn	102±2.4	5.48

To ensure consistency in measurement, blank sample was measured after 20 runs to maintain quality of results.

Statistical Analysis

Paired *t* test was used to determine whether there was a significant difference in seasonal (dry/rainy seasons) data in all measurements made. Principal Component Analysis (PCA) was applied for the analysis of experimental data to establish whether variables measured showed any correlation and to reduce the dimensionality of data collected on temperature, pH, electrical conductivity and heavy metal levels (Cd, Pb, Cr, Cu, Zn). PCA was carried out by Statistical Package for the Social Sciences, IBM SPSS Statistics software, version 28.0.0.0 (190).

RESULTS AND DISCUSSION

Physicochemical Characteristics

The measured physicochemical parameters in groundwater for the three sampling sites i.e. residential areas, near petrol stations and dumping sites are shown in Tables 3 a – c.

Temperature

As shown in Tables 3 a-c, the temperature of groundwater varied from 25.0oC to 32.1oC in the dry season and 25.5oC to 32.1oC in the rainy season. Generally, slightly higher temperatures were recorded in the rainy season than during the dry season for several sampling points. However, a paired t-test at p= 0.05 (two tailed) did not show significant difference in temperature measured between dry and rainy season since texp < tcrit: Petrol stations (student texp = 0.208, tcrit = 2.110, df = 17); dumping site (student texp = 0.304, tcrit = 2.145, df = 14); Residential areas (student texp = 0.625, tcrit = 2.086, df = 20).

Based on mean temperature, groundwater temperature was slightly lower in petrol stations (Table 3 a) than either dumping sites (Table 3 b) or residential areas (Table 3c), which showed similar temperatures. This may indicate that water from dumping sites and residential areas may exhibit slightly different physicochemical and biological characteristics such as electrical conductivity and ability to support microorganism growth (UNICEF, 2008).

Comparatively, Adekunle et al. (2020) reported a narrower temperature range in dry season (25.83 ±3.03 °C to 28.02 ± 0.79 °C) and rainy season (27.19 ± 0.00 °C to 28.93 ± 1.30 °C) for groundwater from Osun State, Nigeria. An equally narrow temperature range was

Table 3: Physicochemical parameters in groundwater

(a) Near petrol stations

Sampling point	Temperature (ºC)		pH		Electrical Conductivity (µScm^{-1})	
	Dry	Rainy	Dry	Rainy	Dry	Rainy
PS 1	28.0±0.2	29.8±0.3	6.2±0.3	6.9±0.4	1846.0±3	1885.0±7
PS 2	31.0±0.1	30.4±0.8	7.0±0.1	7.0±0.1	1360.0±14	1350.0±14
PS 3	30.0±0.5	28.5±1.0	6.0±0.1	6.0±0.3	1387.5±2	1394.5±6
PS 4	30.0±0.3	30.0±0.8	6.4±0.2	6.7±0.3	1344.0±5	1444.0±8
PS 5	30.0±0.8	31.0±0.3	6.7±0.1	6.8±0.4	1823.0±4	1816.0±4
PS 6	31.0±0.4	30.6±0.2	6.1±0.1	6.4±0.2	1599.0±12	1529.0±8
PS 7	27.6±0.2	27.9±0.3	6.2±0.1	6.5±0.4	2490.0±23	2400.0±23
PS 8	26.7±0.4	26.5±0.2	6.4±0.2	6.2±0.6	1855.0±21	1833.0±14
PS 9	29.9±0.3	29.3±0.2	6.0±0.1	6.0±0.1	1223.5±23	1247.5±3
PS 10	28.6±0.2	28.9±0.1	5.9±0.3	5.9±0.3	1276.0±19	1285.0±7
PS 11	29.0±0.3	28.5±0.2	6.2±0.1	6.2±0.2	1262.0±23	1260.0±19
PS 12	32.0±0.2	32.1±0.1	6.0±0.2	6.7±0.3	568.0±24	568.0±24
PS 13	26.0±0.1	25.8±0.2	6.2±0.1	6.5±0.2	735.5±14	779.5±14
PS 14	25.0±0.7	28.5±0.2	6.0±0.2	6.0±0.4	972.0±22	974.5±22
PS 15	28.0±0.2	29.8±0.1	7.2±0.3	7.0±0.1	1000.5±17	1009.5±18
PS 16	25.0±0.7	25.5±0.7	6.3±0.1	6.9±0.1	1978.5±19	1962.5±21
PS 17	27.0±0.1	27.5±0.2	6.2±0.1	6.9±0.1	1492.0±14	1482.0±19
PS 18	29.0±0.1	29.5±0.3	6.3±0.1	7.0±0.1	1115.0±16	1115.0±16
Mean	28.5±1.6	28.8±1.8	6.3±0.6	6.5±0.7	1407.0±48	1407.5±48
%Compliance	-	-	TBS- 100 WHO 17	TBS - 100 WHO - 55	TBS - 100 WHO - 17	TBS - 100 WHO - 17

(b) Near Dumping sites

Sampling point	Temperature (ºC)		pH		Electrical Conductivity (µScm^{-1})	
	Dry	Rainy	Dry	Rainy	Dry	Rainy
D 1	30.6±0.2	30.1±0.1	7.0±0.6	7.3±0.4	256.5±23	256.5±23
D 2	30.6±0.1	31.6±0.7	6.4±0.1	6.8±0.2	2372.0±9	2385.0±7
D 3	27.0±0.2	27.8±0.4	5.3±0.2	5.7±0.5	1864.0±11	1846.0±10
D 4	30.0±0.1	30.0±0.1	6.5±0.1	6.1±0.1	1249.0±8	1243.0±9
D 5	32.1±0.7	30.0±0.2	6.8±0.1	6.9±0.2	1286.0±12	1291.0±12
D 6	31.8±0.2	30.8±0.1	6.4±0.1	6.5±0.2	1256.0±7	1240.0±8
D 7	28.9±0.4	28.9±0.2	6.4±0.2	6.4±0.1	687.0±12	687.0±11
D 8	28.8±0.1	28.8±0.1	6.2±0.1	6.5±0.2	1444.0±13	1438.0±12
D 9	30.4±0.2	29.4±0.3	7.0±0.6	7.0±0.1	1023.0±10	1038.5±8
D 10	27.9±0.4	27.9±0.1	6.6±0.2	6.4±0.2	2464±21	2470±28
D 11	26.9±1.3	26.9±1.0	6.8±0.1	6.5±0.1	568.0±7	558.0±5
D 12	29.0±0.2	27.5±0.2	6.6±0.2	6.5±0.2	777.0±9	769.0±9
D 13	28.0±0.1	28.5±0.1	6.3±0.1	6.8±0.2	977.0±11	949.0±7
D 14	30.0±0.1	29.0±0.2	6.2±0.1	6.8±0.1	1923.0±11	1927.5±11
D 15	30.5±0.2	31.5±0.2	6.3±0.1	6.2±0.1	1496.0±13	1496.5±6
Mean	29.5±1.6	29.2±1.3	6.4±0.9	6.6±0.9	1309.5±49	1306±49
% Compliance	-	-	TBS - 93 WHO - 47	TBS - 100 WHO - 67	TBS - 100 WHO - 33	TBS - 100 WHO - 33

(c) Residential areas

Sampling point	Temperature (ºC)		pH		Electrical Conductivity (μScm^{-1})	
	Dry	Rainy	Dry	Rainy	Dry	Rainy
S1	29.0±0.3	28.4±0.3	6.2±0.1	6.8±0.2	1645.0±6	1629.5±14
S 2	30.0±0.1	29.6±0.4	6.7±0.1	6.3±0.1	1178.0±4	1174.0±9
S 3	32.0±1.0	30.1±0.5	5.2±0.2	5.9±0.2	5286.0±19	5270.5±18
S 4	31.4±0.3	29.3±0.4	5.2±0.2	5.5±0.2	1845.0±11	1865.5±8
S 5	29.0±0.2	28.4±0.2	6.3±0.1	6.9±0.3	1669.0±9	1666.5±11
S 6	31.0±0.4	31.1±0.2	6.3±0.2	6.8±0.2	1056.0±12	1048.5±7
S 7	25.6±0.4	25.6±0.7	6.4±0.1	6.7±0.2	790.0±14	783.0±9
S 8	32.0±0.9	28.0±0.4	6.1±0.1	6.3±0.2	1023.0±8	1033.0±7
S 9	29.0±0.3	29.6±0.1	6.2±0.1	6.4±0.2	1056.0±8	1098.5±12
S 10	29.0±0.2	29.6±0.2	6.3±0.3	6.0±0.1	1169.0±11	1189.0±13
S 11	30.0±0.2	30.4±0.4	5.2±0.2	5.6±0.1	1670.0±13	1660.0±9
S 12	30.0±0.1	30.2±0.2	6.2±0.3	6.6±0.1	1467.0±12	1400.5±8
S 13	28.0±0.3	28.4±0.1	6.8±0.1	7.1±0.4	1156.5±10	1168.5±11
S 14	27.0±0.2	29.6±0.3	6.2±0.2	6.1±0.1	681.0±7	681.5±12
S 15	28.0±0.3	28.8±0.4	6.1±0.1	6.3±0.2	1278.0±9	1178.5±10
S 16	29.0±0.1	29.8±0.2	6.0±0.1	6.2±0.1	387.0±5	397.0±5
S 17	31.0±0.2	30.6±0.1	6.1±0.2	6.5±0.2	376.0±6	363.5±11
S 18	29.0±0.3	31.4±0.6	6.7±0.1	6.1±0.1	295.0±23	295.5±18
S 19	25.3±0.2	29.3±0.3	6.2±0.1	6.6±0.2	2856.0±11	2895.0±13
S 20	30.0±0.3	30.8±0.4	6.3±0.2	6.5±0.2	987.0±7	982.0±7
S 21	30.0±0.1	30.1±0.1	6.7±0.4	6.0±0.1	377.0±8	390.0±4
Mean	29.1±1.3	29.4±1.3	6.2±0.8	6.3±0.8	1118.8±45	1116.4±42
% Compliance	-	-	TBS- 86 WHO-19	TBS- 100 WHO-43	TBS -91 WHO - 33	TBS - 91 WHO - 33

reported by Vunain et al. (2019) [25.4 to 28.5oC] and Owamah (2020) [25.4 to 27.9oC] on groundwater from Malawi and Niger Delta in Nigeria, respectively. However, a wider temperature range (23.4 to 32.7oC) was reported by Sheikh et al. (2018) on groundwater in Zanzibar island. The influence of ambient temperature on groundwater temperature may explain the variation of temperature in groundwater.

Groundwater pH

Results (Tables 3 a-c) generally show that groundwater is slightly more acidic in dry season than rainy season, probably due to more dissolved solids in the dry season. However, a paired t-test at p= 0.05 (two tailed) did not show significant difference in pH measured between dry and rainy seasons since texp < tcrit: Petrol stations (student texp = 0.006, tcrit = 2.110, df = 17); Dumping sites (student texp = 0.192, tcrit = 2.145, df = 14); Residential areas (student texp = 0.045, tcrit = 2.086, df = 20).

The pH of groundwater analysed in this work, which ranged from pH 5.2±0.2 to 7.2±0.3 in dry season and pH 5.5±0.3 to 7.3±0.4 in wet season largely satisfied TBS (2018) specifications. (pH range 5.5-9.5). However, the pH of several samples (PS 6-PS14; D13-D15, S3-S12), lie below the lower limit of WHO (2017) guidelines (pH range 6.5-8.5). The pH range in groundwater from Osun Nigeria, reported by Adekunle et al. (2020) in dry season (pH 6.22 ± 0.67 to 7.74 ± 0.04) and rainy season (pH 6.73 ± 0.38 to 9.93 ± 1.29) for the wet season, is higher than that determined in this work.

Based on mean pH, groundwater from residential areas showed slightly more acidic pH (Table 3c) than either groundwater from near petrol stations (Table 3a) or dumping sites (Table 3b).

This trend is consistent with compliance to TBS/WHO standards, where percentage of sampling points (Table 3c) complying with TBS/WHO standards is lowest in residential areas, followed by petrol stations and finally by dumping sites. It is worth noting that acidic pH values much lower than those specified by either WHO or TBS standards for groundwater were observed at a few points (D3, S3, S4), which are located near industries where semi-treated or untreated industrial effluents are released into the immediate environment. Basically, pH of natural water is determined by equilibrium among carbon dioxide, carbonate and bicarbonate. However, it is influenced by various factors including geological composition arising from chlorides, nitrates (Napacho and Manyere, 2010) and anthropogenic activities originating from municipal and industrial discharges (Bhattacharya, 1988).

The pH of groundwater in this work (mean: pH 6.2 to 6.6) is lower than groundwater from Temeke district reported by Napacho and Manyere (2010) (mean pH 7.4, range pH 6.2 to 8.2) on deep and shallow wells. The slightly alkaline groundwater reported by Napacho and Manyere (2010) indicate the presence of alkaline chemical species, which may be natural or anthropogenic in origin (Bhattacharya, 1988).

Electrical Conductivity (EC)

The results (Tables 3 a-c) generally show that the conductivity of groundwater is slightly higher in dry season than in rainy season. This could be due to an increase in concentration of salts, organic and

inorganic materials runoff from domestic and other human activities. Similar to temperature and pH, a paired t-test at p= 0.05 (two tailed) did not show significant difference in electrical conductivity measured between dry and rainy season since texp < tcrit: Petrol stations (student texp = 0.966, tcrit = 2.110, df = 17); Dumping sites (student texp = 0.414, tcrit = 2.145, df = 14); Residential areas (student texp = 0.593, tcrit = 2.086, df = 20).

The electrical conductivity in dry season (mean: 1278.4, range 256.5±23 to 5286±19) and rainy season (mean: 1276.8, range: 256±23 to 5270±18) are much higher than those reported by Adekunle et al. (2020) from Osun Nigeria, in dry season (mean: 336.60 µs cm-1, range:126.02 ± 15.72 µs cm-1 to 556.03 ± 106.60 µs cm-1) and rainy season (mean: 377.95 µs cm-1, range:149.88 ± 16.92 µs cm-1 to 606.65 ± 57.91 µs cm-1). Such a difference in electrical conductivity could be due to the geological composition of an area, low ion exchange between soil and water, type and concentration of ions and temperature.

Trend in electrical conductivity followed the trend (mean EC): Residential areas < near dumping sites < near petrol station. Groundwater samples analysed in this work satisfied the TBS (2018) electrical conductivity's maximum value (2500 □Scm-1 for untreated water) except for a few points which registered higher values (PS7 in Table 3 a). Results showed that the highest conductivity was registered in groundwater drawn from residential areas (S3). This may be due to the contribution of highly conducting ions like K+, Cl-, Na+, which impart a salty taste in groundwater as was observed in several sampling points. Noteworthy, groundwater from near petrol stations and dumping sites complied with the TBS specifications. A comparison of electrical conductivity against WHO guidelines (1000 □Scm-1), however, shows limited compliance (33%).

In some cases, electrical conductivity provides an indication of ocean water intrusion on groundwater as shown by several sampling points (S5, S19, PS1), which lie closer to the Indian Ocean and show high electrical conductivity.

Comparison with the study by Sojobi (2016) on groundwater from North central Nigeria (mean: 300 – 530 □Scm-1) and Owamah (2020) from

Niger Delta (mean: 84.5- 92.7 □Scm-1), shows that groundwater in this work is much higher probably due to high concentration of Cl- and Na+ in groundwater (Napacho and Manyele, 2010).

Heavy Metal Levels in Groundwater

Tables 4 a-c summarize levels of the heavy metals analysed at the three sampling sites over dry and rainy seasons. Cd, Pb, Cr, Cu and Zn were selected for analysis based on anthropogenic activities in the study area. Generally, average heavy metal levels were higher in the dry season than rainy season. Seasonal variation in levels of heavy metals can be associated with slow/poor groundwater flow since no recharge from rainfall occurs in the dry season. As a result, heavy metals tend to increasingly accumulate and settle in groundwater wells/boreholes, thereby increasing concentration in water (Mato, 2002).

Noteworthy, sampling points near petrol stations produced consistently highest average levels of Cr and Cd, while sampling points near dumping sites recorded the highest average levels for Pb, Cu and Zn. Groundwater from residential areas contained intermediate levels of Cr and Zn.

Table 4: Heavy metal levels in ground water

(a) Near Petrol stations

Sampling points	Metal Concentration/mgL^{-1}									
	Cd [0.003 mgL^{-1}]*		Pb [0.01 mgL^{-1}]*		Cr [0.05 mgL^{-1}]*		Cu [1.0 mgL^{-1}]*#		Zn [5.0 mgL^{-1}] *$	
	Dry	Rainy	Dry	Rainy	Dry	Rainy	Dry	Rainy	Dry	Rainy
PS 1	0.36±0.01	0.39±0.01	0.39±0.010	0.21±0.02	0.42±0.02	0.02±0.001	0.01±0.001	0.02±0.001	0.25±0.01	0.25±0.01
PS 2	0.04±0.001	0.04±0.001	0.04±0.001	0.05±0.01	0.33±0.02	0.03±0.001	0.02±0.001	0.04±0.001	0.07±0.005	0.07±0.005
PS 3	0.24±0.05	0.22±0.01	0.24±0.01	0.03±0.001	0.27±0.01	0.01±0.001	0.20±0.01	0.20±0.01	0.44±0.01	0.44±0.01
PS 4	0.06±0.002	0.04±0.001	0.06±0.02	0.03±0.001	0.06±0.001	0.08±0.01	0.50±0.01	0.02±0.001	0.05±0.001	0.09±0.02
PS 5	0.13±0.05	0.13±0.01	0.13±0.02	0.32±0.01	0.31±0.02	0.11±0.01	0.02±0.001	0.02±0.001	0.04±0.001	0.09±0.02
PS 6	0.01±0.001	0.01±0.001	0.01±0.001	0.17±0.02	0.15±0.02	0.15±0.01	0.01±0.001	0.01±0.001	0.58±0.01	0.52±0.01
PS 7	0.02±0.001	0.02±0.001	0.02±0.001	0.98±0.04	0.02±0.001	0.04±0.001	0.01±0.001	0.01±0.001	0.08±0.005	0.02±0.001
PS 8	0.03±0.001	0.03±0.001	0.03±0.001	0.20±0.02	0.01±0.001	0.03±0.001	0.02±0.001	0.01±0.001	0.07±0.005	0.06±0.005
PS 9	0.04±0.001	0.04±0.001	0.04±0.001	1.10±0.01	0.01±0.001	0.02±0.001	0.01±0.001	0.01±0.001	0.50±0.01	0.05±0.005
PS 10	0.30±0.01	0.03±0.001	0.30±0.01	0.90±0.01	0.01±0.001	0.04±0.001	0.01±0.001	0.04±0.001	0.07±0.005	0.04±0.001
PS 11	0.02±0.001	0.03±0.001	0.02±0.001	0.01±0.001	0.01±0.001	0.23±0.01	0.01±0.001	0.02±0.001	0.01±0.001	0.02±0.001
PS 12	0.04±0.001	0.03±0.001	0.04±0.001	0.30±0.01	1.10±0.01	1.00±0.01	0.03±0.001	0.03±0.001	0.01±0.001	0.01±0.001
PS 13	0.04±0.001	0.04±0.001	0.04±0.001	0.15±0.01	0.45±0.02	0.35±0.01	0.13±0.01	0.13±0.01	0.01±0.001	0.01±0.001
PS 14	0.50±0.01	0.45±0.01	0.50±0.01	0.60±0.01	0.03±0.001	0.03±0.001	0.80±0.01	0.87±0.02	0.08±0.02	0.01±0.001
PS 15	0.01±0.001	0.01±0.001	0.01±0.001	0.04±0.001	0.27±0.001	0.25±0.02	0.10±0.001	0.10±0.001	0.06±0.02	0.03±0.001
PS 16	0.01±0.001	0.01±0.001	0.02±0.001	0.08±0.002	0.58±0.01	0.21±0.01	1.70±0.01	1.30±0.01	0.02±0.001	0.06±0.005
PS 17	0.08±0.002	0.03±0.001	0.08±0.02	0.20±0.02	1.01±0.01	0.34±0.01	0.60±0.02	0.80±0.02	0.01±0.001	0.04±0.001
PS 18	0.40±0.01	0.05±0.01	0.40±0.01	0.20±0.02	0.12±0.02	0.04±0.001	0.37±0.01	0.02±0.001	0.01±0.001	0.03±0.001
Mean	0.13±0.07	0.09±0.02	0.13±0.04	0.31±0.06	0.29±0.05	0.17±0.03	0.25±0.03	0.20±0.03	0.13±0.03	0.10±0.03
% Compliance	TBS/WHO 0	TBS/WHO 0	TBS/WHO 11	TBS/WHO 6	TBS/WHO 33	TBS/WHO 50	TBS 94	TBS 94	TBS 100	TBS 100

(b) Near Dumping sites

Sampling points	Metal Concentration /mgL^{-1}									
	Cd [0.003 mgL^{-1}]*		Pb [0.01 mgL^{-1}]*		Cr [0.05 mgL^{-1}]*		Cu [1.0 mgL^{-1}]*#		Zn [5.0 mgL^{-1}] *$	
	Dry	Rainy	Dry	Rainy	Dry	Rainy	Dry	Rainy	Dry	Rainy
D 1	0.01±0.001	0.01±0.001	0.65±0.002	0.55±0.01	0.01±0.001	0.01±0.001	0.16±0.005	0.13±0.005	0.40±0.005	0.20±0.002
D 2	0.10±0.005	0.01±0.001	1.22±0.01	1.02±0.01	0.01±0.001	0.01±0.001	0.35±0.005	0.25±0.01	0.12±0.002	0.11±0.005
D 3	0.01±0.001	0.02±0.001	0.35±0.005	0.34±0.01	0.01±0.001	0.01±0.001	0.08±0.01	0.07±0.002	0.60±0.01	0.70±0.01
D 4	0.05±0.001	0.02±0.001	0.57±0.01	0.52±0.01	0.01±0.001	0.01±0.001	0.23±0.01	0.13±0.005	0.28±0.005	0.28±0.01
D 5	0.06±0.02	0.03±0.001	0.36±0.01	0.33±0.01	0.01±0.001	0.01±0.001	1.00±0.05	0.89±0.01	0.56±0.010	0.58±0.01
D 6	0.01±0.001	0.02±0.001	0.01±0.001	0.01±0.001	0.01±0.001	0.01±0.001	0.67±0.01	0.01±0.001	0.50±0.010	0.50±0.01
D 7	0.28±0.01	0.03±0.001	1.02±0.01	1.00±0.01	0.02±0.001	0.02±0.001	1.33±0.01	1.23±0.01	1.77±0.01	1.27±0.01
D 8	0.01±0.001	0.04±0.001	0.90±0.01	0.89±0.01	0.01±0.001	0.01±0.001	0.98±0.01	0.88±0.01	1.82±0.01	1.62±0.01
D 9	0.07±0.005	0.03±0.001	0.86±0.01	0.86±0.01	0.23±0.01	0.01±0.001	0.14±0.01	0.12±0.01	0.27±0.01	0.26±0.005
D 10	0.02±0.001	0.27±0.010	0.73±0.005	0.64±0.01	0.01±0.001	0.01±0.001	0.27±0.01	0.07±0.005	0.12±0.005	0.13±0.005
D 11	0.01±0.001	0.29±0.010	0.78±0.005	0.77±0.005	0.01±0.001	0.02±0.001	0.01±0.001	0.01±0.001	0.01±0.001	0.02±0.001
D 12	0.07±0.005	0.20±0.01	0.02±0.001	0.01±0.001	0.03±0.001	0.01±0.001	0.01±0.001	0.01±0.001	0.01±0.001	0.01±0.001
D 13	0.03±0.001	0.27±0.01	0.12±0.005	0.03±0.001	0.04±0.001	0.01±0.001	0.01±0.001	0.01±0.001	0.01±0.001	0.01±0.001
D 14	0.09±0.005	0.07±0.005	0.01±0.001	0.01±0.001	0.03±0.001	0.01±0.001	0.01±0.001	0.01±0.001	0.01±0.001	0.03±0.001
D 15	0.01±0.001	0.02±0.001	0.01±0.001	0.22±0.01	0.01±0.001	0.01±0.001	0.01±0.001	0.01±0.001	0.01±0.001	0.02±0.001
Mean	0.06±0.02	0.08±0.02	0.50±0.03	0.48±0.03	0.03±0.01	0.01±0.003	0.35±0.06	0.26±0.02	0.43±0.03	0.38±0.03
% Compliance	TBS/WHO 0	TBS/WHO 0	TBS/WHO 20	TBS/WHO 20	TBS/WHO 93	TBS/WHO 87	TBS 87	TBS 93	TBS 100	TBS 100

(c) Residential areas

Sampling points	Heavy metal concentration/mgL^{-1}									
	Cd [0.003 mgL^{-1}]*		Pb [0.01 mgL^{-1}]*		Cr [0.05 mgL^{-1}]*		Cu [1.0 mgL^{-1}]*#		Zn [5.0 mgL^{-1}] *$	
	Dry	Rainy	Dry	Rainy	Dry	Rainy	Dry	Rainy	Dry	Rainy
S1	0.04±0.005	0.02±0.001	0.23±0.01	0.01±0.001	0.01±0.001	0.01±0.001	0.01±0.001	0.01±0.001	0.13±0.01	0.02±0.001
S 2	0.06±0.005	0.01±0.001	0.05±0.002	0.01±0.001	0.01±0.001	0.01±0.001	0.01±0.001	0.01±0.001	0.45±0.01	0.09±0.01
S 3	0.01±0.001	0.01±0.001	0.05±0.002	0.01±0.001	0.01±0.001	0.01±0.001	0.01±0.001	0.01±0.001	0.62±0.01	0.02±0.001
S 4	0.01±0.001	0.01±0.001	0.01±0.001	0.01±0.001	0.01±0.001	0.01±0.001	0.01±0.001	0.01±0.001	0.50±0.01	0.03±0.001
S 5	0.03±0.001	0.01±0.001	0.04±0.01	0.01±0.001	0.01±0.001	0.01±0.001	0.01±0.001	0.01±0.001	0.55±0.005	0.04±0.001
S 6	0.05±0.005	0.02±0.001	0.65±0.02	0.01±0.001	0.01±0.001	0.01±0.001	0.01±0.001	0.01±0.001	0.23±0.005	0.22±0.01
S 7	0.04±0.001	0.01±0.001	0.07±0.005	0.01±0.001	0.01±0.001	0.03±0.001	0.01±0.001	0.01±0.001	0.44±0.01	0.23±0.01
S 8	0.07±0.005	0.01±0.001	0.06±0.005	0.01±0.001	0.01±0.001	0.02±0.001	0.01±0.001	0.01±0.001	0.69±0.01	0.07±0.01
S 9	0.09±0.01	0.01±0.001	0.09±0.01	0.01±0.001	0.06±0.005	0.45±0.01	0.01±0.001	0.01±0.001	0.29±0.005	0.15±0.01
S 10	0.07±0.005	0.01±0.001	0.04±0.001	0.01±0.001	0.06±0.005	0.03±0.001	0.01±0.001	0.01±0.001	0.65±0.01	0.45±0.01
S 11	0.03±0.001	0.02±0.001	0.02±0.001	0.01±0.001	0.01±0.001	0.01±0.001	0.01±0.001	0.01±0.001	0.01±0.001	0.01±0.001
S 12	0.10±0.01	0.01±0.001	0.01±0.001	0.01±0.001	0.08±0.01	0.04±0.001	0.02±0.001	0.01±0.001	0.03±0.001	0.01±0.001
S 13	0.01±0.001	0.03±0.001	0.01±0.001	0.01±0.001	0.03±0.001	0.02±0.001	0.20±0.01	0.01±0.001	0.08±0.01	0.01±0.001
S 14	0.01±0.001	0.01±0.001	0.01±0.001	0.01±0.001	0.01±0.001	0.01±0.001	0.03±0.001	0.01±0.001	0.02±0.001	0.01±0.001
S 15	0.06±0.005	0.01±0.001	0.01±0.001	0.01±0.001	0.01±0.001	0.01±0.001	0.02±0.001	0.01±0.001	0.02±0.001	0.01±0.001
S 16	0.03±0.001	0.01±0.001	0.01±0.001	0.01±0.001	0.23±0.01	0.20±0.01	0.01±0.001	0.01±0.001	0.07±0.01	0.01±0.001
S 17	0.06±0.005	0.01±0.001	0.59±0.01	0.02±0.001	0.45±0.02	0.03±0.001	0.01±0.001	0.01±0.001	0.02±0.001	0.01±0.001
S 18	0.05±0.005	0.03±0.001	0.27±0.01	0.23±0.002	0.34±0.01	0.12±0.005	0.05±0.001	0.02±0.001	0.01±0.001	0.01±0.001
S 19	0.03±0.001	0.01±0.001	0.21±0.01	0.15±0.005	0.11±0.005	0.23±0.01	0.01±0.001	0.01±0.001	0.01±0.001	0.01±0.001
S 20	0.04±0.001	0.01±0.001	0.15±0.01	0.35±0.01	0.21±0.01	0.01±0.001	0.01±0.001	0.01±0.001	0.01±0.001	0.01±0.001
S 21	0.01±0.001	0.01±0.001	0.34±0.005	0.04±0.001	0.20±0.01	0.01±0.001	0.01±0.001	0.01±0.001	0.01±0.001	0.01±0.001
Mean	0.04±0.02	0.01±0.005	0.14±0.03	0.05±0.01	0.09±0.02	0.06±0.02	0.02±0.001	0.01±0.005	0.23±0.03	0.07±0.02
% Compliance	TBS/WHO 0	TBS/WHO 0	TBS/WHO 29	TBS/WHO 75	TBS/WHO 58	TBS/WHO 80	TBS 100	TBS 100	TBS 100	TBS 100

*TBS/WHO limits; #WHO limit for Cu is 2.0 mgL^{-1}; $ WHO limit for Zn is Not determined (ND)

Heavy metal concentration may be influenced by the temperature of water because higher temperatures tend to influence chemical reactions in groundwater and facilitate metal dispersion in water wells and aquifers. Similarly, pH influences metal ion concentration. Low pH values tend to favour increased heavy metal availability in the groundwater since low pH causes heavy metal dissolution in water (Mato, 2002). On the other hand, high pH values result in precipitation of the metal, leading to the metal's deposition on sediments and thereby reducing their availability in water (Jorgensen, 1994). Heavy metal concentration is also influenced by electrical conductivity. Higher conductivity reflects a higher concentration of free ions in water which tends to reduce heavy metals concentration in groundwater (Mazar and Ahmad, 2020). Lower values of electrical conductivity, on the other hand, represent a lower concentration of free ions hence increasing the level of heavy metals in the groundwater.

Variation in levels of heavy metals among the three sampling sites can therefore be ascribed mainly to anthropogenic activities including industrial effluent discharges and leakage of petroleum products around the sampling points.

Cadmium (Cd)

As shown in Tables 4 a-c, Cd levels were higher in the dry season compared to the rainy season. A paired t-test at p= 0.05 (two tailed), however, did not show significant difference in average Cd levels measured between dry and rainy season since texp < tcrit: Petrol stations (student texp = 0.106, tcrit = 2.110, df = 17); dumping sites (student texp = 0.372, tcrit = 2.145, df = 14); Residential areas (student texp = 0.001, tcrit = 2.086, df = 20).

Cd Levels (annual average) among sampling sites followed the trend: Near petrol stations > near dumping sites > residential areas. The highest concentration of Cd near petrol stations could be attributed to various activities carried out at sampling points including washing of cars, leakage/spillage of petroleum products (petrol, diesel) and lubricating oils containing Cd additives, and maintenance/repairs of engines in garages located in/near petrol stations. Levels of Cd in former dumping site populated with garages could be associated with paints/ pigments in body works, dumping of batteries and spillage of petroleum products. In the active dumping site, levels of Cd are enhanced by incineration, which

contributes to the Cd burden from wastes disposed at the site. Cd content in groundwater obtained from residential areas was the lowest and may originate from several sources including poor control and management of solid wastes and unregulated disposal of Cd-containing batteries (Breeze, 2012).

The results showed that Cd levels in groundwater did not comply with TBS (2018) and WHO (2017) standards in all sampling sites. This implies that a sizable proportion of residents in the study area is exposed to Cd levels beyond acceptable limits, thereby adversely affecting public health of the community. It is worth noting that Saria et al. (2011) and Mahugija (2018) reported low cadmium concentration (< 0.01 mgL-1) in tapwater from locations near the study area.

Generally, the level of Cd obtained in this work is lower than that reported at Nangodi, a small-scale mining area of Northern Ghana (Cobbina et al., 2015) with a concentration range 0.001 – 2.227 mgL-1, but slightly higher than those determined at Lokpaukwu, Nigeria (Ezekwe et. al., 2012) with a concentration range of 0 - 0.258 mgL-1. In comparison, research work by Sheikh et al. (2018) reported a very low concentration of Cd (0.001 mg/L) which are within the WHO and TBS standards. Similarly, low levels were reported by Carasek et al. (2020) from the Serra Geral aquifer in Southern Brazil (0.003 mgL-1), which supply groundwater to nearby urban centres. The low level of Cd in these areas may indicate a lower contamination from the main anthropogenic sources including, paints, pigments, fertilizers and unregulated disposal of Cd-containing batteries.

Lead (Pb)

Tables 4 a-c show that Pb levels were generally higher in the dry season than in the rainy season except for some sites near the petrol station. A paired t-test at p = 0.05 (two tailed) did not show significant difference in lead levels measured between dry and rainy season since texp < tcrit: Petrol stations (student texp = 0.049, tcrit = 2.110, df = 17); Dumping sites (student texp = 0.238, tcrit = 2.145, df = 14); Residential areas (student texp = 0.038, tcrit = 2.086, df = 20).

As far as distribution among sampling sites is concerned, Pb levels (annual average) followed the trend: Dumping sites > petrol stations > residential areas. Leaching from waste disposal could be responsible for

the high availability of Pb near dumping sites whereas Pb level in sites near petrol stations could be due to leakage or minor spillages of petroleum products which contain Pb. It is worth noting that Pb is considered toxic even at low concentrations (Groyer, 1996). In comparison to tapwater in the nearby locations, Saria et al. (2011) reported Pb level below 0.01 mgL-1 while Mahugija (2018) reported mean pb concentration of 0.08 mgL-1 at Mbagala. Thus, residents relying on either tapwater or groundwater are at risk of suffering from health problems associated with acute lead poisoning (US EPA, 1986) as well as cumulative general metabolic poisoning (Khan et al., 2009).

Approximately 80% - 92 % of groundwater near petrol stations (Table 4a) and dumping sites (Table 4b), respectively, contain Pb levels above TBS & WHO standards. Despite containing the lowest concentration (annual mean) of Pb compared to the other two sites, about 25-70 % of groundwater from residential areas exceeded the TBS (2017) and WHO (2018) standards. Thus, population in the study area is exposed to non-permissible levels of lead through groundwater.

The Pb levels obtained from this work are much higher than those determined by Sheikh et al. (2018), who reported levels of Pb in groundwater in rural and urban Zanzibar (0 - 0.0027 mgL-1), which lie within WHO (2018) and TBS (2017) standards. Work by Ahmad et al. (2019) in Mathura city, Utar Pradesh India reported higher levels (0.62 - 5.888 mgL-1), which also exceed WHO limits. Results by Akinbile and Yusoff (2011) at Akure Nigeria (0 - 1.21 mgL-1) and Rezende et al. (2019) in southern Brazil (0.005- 0.92 mgL-1) on groundwater in urban areas are comparable to those determined in this work. However, Oyeku and Eludoyin (2010) reported much higher levels of Pb (0 - 14.8 mgL-1) in Ojota, Nigeria due to industrial effluents pollution. Interestingly, Ezekwe et al. (2012) reported no Pb in groundwater despite being located close to the mining site, indicating that environmental management is crucial to water quality.

Chromium (Cr) Similar to Cd and Pb, levels of Cr (Tables 4 a-c) were higher in the dry season than in the rainy season. However, paired t-test at $p = 0.05$ (two tailed) did not show significant difference in Cr levels measured between the seasons since texp < tcrit: Petrol stations (student texp = 0.026, tcrit = 2.110, df = 17); Dumping sites (student texp = 0.223,

tcrit = 2.145, df = 14); Residential areas (student texp = 0.395, tcrit = 2.086, df = 20).

Tables 4 a-c show that Cr levels (annual mean) followed the trend: Petrol stations > residential areas > dumping sites. In petrol stations, Cr originates from additives in petroleum products, and corrosion of alloys and anti-corrosion reagents from car washing machines. In residential areas, Cr may come from unregulated disposal of solid wastes containing dyes, pigments and pressure-treated lumber and refractory bricks.

Results further showed that between 50-67% of water samples drawn near petrol stations, 20-40% of samples from residential areas and approximately 10% of the water from dumping sites exceeded the TBS (2018) and WHO (2017) standards.

Previous work by Sheikh et al. (2018) on groundwater from Zanzibar, reported lower levels of Cr (0.001 - 0.028 mgL-1) compared to this work. Results obtained in this work, especially from petrol stations were similar to those reported by Akinbile and Yusoff (2011) on groundwater from a site near a landfill in Akure Nigeria (0 - 0.25 mgL-1). It is worth noting that Sharma and Dutta (2017) reported higher levels of Cr (0 - 2.66 mgL-1) in Malwa region, Punjab India, due to untreated disposal of effluents from electroplating and manufacturing industries.

Copper (Cu)

As shown in Tables 4 a-c, levels of Cu in groundwater are generally higher in dry season than in rainy season. A paired t-test at p= 0.05 (two tailed), however, did not show significant difference in copper levels measured between dry and rainy season since texp < tcrit: Petrol stations (student texp = 0.239, tcrit = 2.110, df = 17); Dumping sites (student texp = 0.045, tcrit = 2.145, df = 14); Residential areas (student texp = 0.186, tcrit = 2.086, df = 20).

The level of Cu determined in groundwater followed the trend: Dumping sites > petrol station > residential areas. Leachates of solid wastes containing Cu including leather products, and corrosion of Cu alloys may explain higher concentration of Cu in groundwater. Paints, brake pads and lubricating oils may contribute to the observed levels in petrol stations.

Compliance with TBS (2018) and WHO (2017) standards shows that groundwater from residential areas met the standards, while approximately 7-13% and 6% of groundwater from near dumping sites and petrol stations, respectively, exceeded the same standards.

Sheikh et al. (2018) reported very low values of Cu from shallow wells in Zanzibar ranging from 0 - 0.005 mgL-1. Similarly, Adekunle et al. (2020) reported a lower concentration (mean, 0.002 mg/L-1, range: 0-0.003 mg/L-1) in groundwater from Osun, Nigeria. However, Oyeku and Eludoyin (2010) reported a higher concentration (0 - 33 mgL-1) in groundwater near industrial area/landfill in Ojota Nigeria due to the disposal of industrial solid waste containing copper materials and industrial effluents. Interestingly, Nachiyunde et al. (2013) reported a lower level of Cu (0 - 0.270 mgL-1) in groundwater from the Zambia copper belt despite being located close to a mining area underscoring the importance of management of mining wastes.

Zinc (Zn)

Similar to other heavy metals analysed in this work, Zn concentration in the dry season was higher than rainy season (Tables 4a-c). Like other heavy metals analysed, a paired t-test at p= 0.05 (two tailed), did not show significant difference in Zn levels between dry and rainy season since texp < tcrit: Petrol stations (student texp = 0.287, tcrit = 2.110, df = 17); Dumping sites (student texp = 0.210, tcrit = 2.145, df = 14); Residential areas (student texp = 0.003, tcrit = 2.086, df = 20).

The Level of Zn in groundwater followed the trend: Dumping sites > residential areas ≈ petrol stations. The level of Zn in dumping areas could be contributed by leaching of zinc-containing wastes such as paints, pigments and automotive spare parts. In comparison with tap water from the nearby location (Mbagala), Mahugija (2018) reported a comparable level of Zn (mean = 0.493 mgL-1).

It is worth noting that all samples analysed in this work met the TBS specifications (2018). The permissible levels of Zn may be partly due to the fact that Zn in soil does not dissolve but is deposited primarily in sediments through adsorption and precipitation.

Zn levels in work done by Sheikh et al. (2018) on groundwater in rural and peri urban Zanzibar (0 - 0.135 mg L-1), and Oyeku and Eludoyin (2010) from Ojota Nigeria (0 - 0.23 mgL-1), were much lower than those obtained in this work, despite boreholes being located in an industrial area in Ojota Nigeria. On the other hand, results obtained in this work in groundwater drawn from petrol stations and dumping sites are similar to those reported by Akinbile and Yussof (2011) on boreholes (0 - 2.3 mg L-1) located near a landfill in Akure Nigeria. Similar results were also reported by Mazah and Ahmad (2020) in Bareilly City, in Uttar Pradesh, India (0.75 - 2.245 mg L-1). Noteworthy, WHO guidelines do not specify permissible limits for this metal since it is not considered to exhibit any direct adverse effects at levels it occurs in water. However, elevated levels can make the water less acceptable for drinking.

Statistical Evaluation of physicochemical parameters and heavy metals content in groundwater

PCA was carried out on all seasons' data (Tables 3 a-c and Tables 4 a-c) from 54 samples on Temperature (T), pH, Electrical Conductivity (EC), levels of Cd, Pb, Cr, Cu, and Zn. Table 5 shows the correlation matrix generated. For variables to show any correlation, matrix values should be equal to or greater than 0.3. Most values in Table 5 are indicative of a weak correlation suggesting a weak correlation among the variables measured. The Kaiser-Meyer-Olkin (KMO) value, which measures sampling adequacy, gave a value of 0.51. The KMO value is acceptable although ideally, it should be 0.7-0.8. In addition, the Bartlett test of sphericity yielded $p = 0.04$ indicating the results are significant at $p=0.05$. Both KMO and Bartlett test values show that PCA treatment can produce meaningful relationships on data analysed.

In order to determine principal components, eigen values (initial) equal to or greater than 1 were considered as shown in Table 6. Although all the eight variables measured are regarded as components, the analysis yielded three principal components accounting for 55.3% of the data as shown by the cumulative % loadings (extracted).

It is necessary to extract the component matrix (Table 7a) in order to determine the variables in each component. Ideally, values should be close to 1 or -1 in only one component (mutually exclusive). Accordingly, the first component PC 1 contains Zn, Cu and Pb while the second

component PC 2 consists of Cr, EC and pH. The third component constitutes of Cd and T.

Mathematical rotation of the factors generated in Table 7a is necessary to increase the usefulness and interpretation of results. Orthogonal rotation was applied in this analysis since no correlation among the variables is assumed to exist. Rotation by varimax method confirmed variables in each of the three components as shown in Table 7b. The first component, PC1 made up of Zn, Cu and Pb shows a strong correlation among Zn, Cu and Pb, which is consistent with correlation coefficient determination by Sojobi (2016) and Owamah (2020) on the same heavy metals. As noted by Sojobi (2016) and Owamah (2020), strong correlation may indicate that the three heavy metals either come from

Table 5: Correlation Matrix of the Experimental Variables

	T	pH	EC	Cd	Pb	Cr	Cu	Zn
T	1.000	-0.014	-0.032	-0.199	-0.007	0.092	-0.264	-0.007
pH	-0.014	1.000	-0.127	0.018	-0.005	0.139	0.139	-0.037
EC	-0.032	-0.127	1.000	-0.018	0.022	-0.137	-0.014	-0.037
Cd	-0.199	0.018	-0.018	1.000	0.158	-0.135	0.108	-0.048
Pb	-0.007	-0.005	0.022	0.158	1.000	-0.109	0.330	0.355
Cr	0.092	0.139	-0.137	-0.135	-0.109	1.000	0.045	-0.153
Cu	-0.264	0.139	-0.014	0.108	0.330	0.045	1.000	0.520
Zn	-0.007	-0.037	-0.037	-0.048	0.355	-0.153	0.520	1.000

Table 6: Total Variance of the Variables Measured based on Eigen values

	Initial Eigen values			Extraction Sums of Squared Loadings			Rotation Sums of Squared Loadings		
Component	Total	% of Variance	Cumulative %	Total	% of Variance	Cumulative %	Total	% of Variance	Cumulative %
1	1.904	23.802	23.802	1.904	23.802	23.802	1.818	22.727	22.727
2	1.318	16.477	40.279	1.318	16.477	40.279	1.308	16.348	39.075
3	1.200	14.998	55.277	1.200	14.998	55.277	1.296	16.202	55.277
4	0.949	11.867	67.145						
5	0.866	10.827	77.972						
6	0.811	10.141	88.113						
7	0.596	7.448	95.561						
8	0.355	4.439	100.000						

Table 7: Component matrices of variables measured

(a) Extracted component matrix

	Principal Component		
	PC 1	PC 2	PC3
Cu	**0.804**	0.264	
Zn	**0.750**		0.423
Pb	**0.668**		0.194
Cr	-0.234	**0.675**	
pH		**0.602**	-0.339
EC		**-0.560**	0.144
T	-0.333	0.176	**0.658**
Cd	0.282	-0.274	**-0.640**

(b) Rotated component matrix[b]

	Principal Component		
	PC 1	PC 2	PC 3
Zn	**0.852**		-0.142
Cu	**0.775**	0.232	0.252
Pb	**0.682**	-0.123	
pH		**0.674**	0.160
Cr	-0.135	**0.664**	-0.231
EC		**-0.577**	
T			**-0.754**
Cd			**0.748**

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Rotation Method: Varimax with Kaiser Normalization.[b]

similar sources or metals are mutually dependent on one another. The second component, PC2 contains pH, Cr and Electrical Conductivity (EC), which reveal a moderately strong correlation among the variables. A strong correlation coefficient between pH and electrical conductivity was also reported by Sojobi (2016) and Owamah (2020). The third principal component, PC 3 comprises of temperature (T) and Cd showing the existence of a strong correlation between the two variables. Thus, statistical treatment shows that there is no correlation between temperature of groundwater and all variables except level of cadmium.

According to Owamah (2020), Cd and Cu were correlated to pH and electrical conductivity. This work, however, has shown that Cd and Cu may originate from different sources or are not mutually dependent, since they belong to different Principal Components.

Figure 2 graphically illustrates the variables measured in the three principal components following varimax rotation. As shown in Figure 2, Zn has the strongest influence in PC 1 followed by Cu and Pb. Similarly, Cr and pH show a stronger influence than EC with which they are inversely related, in PC 2. In PC 3, T and Cd show similar influence despite being inversely related.

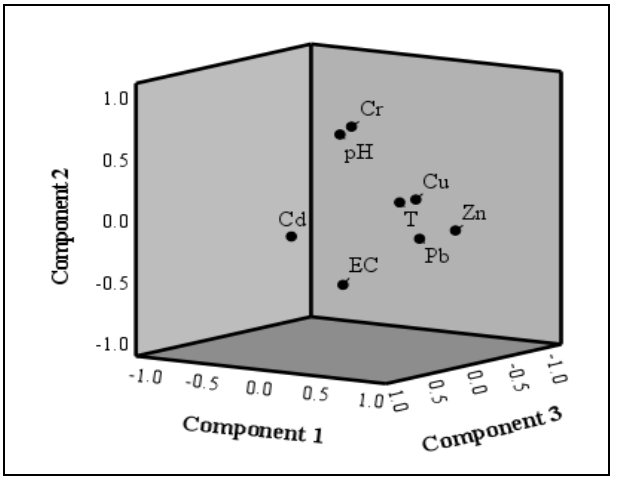

Figure 2: Component plot in rotated space

CONCLUSION

This study examined some physicochemical characteristics and heavy metal levels in groundwater, which is used by approximately 25% of the residents in Dar es Salaam city. Paired t- test shows that there is no significant difference in physicochemical parameters and heavy metal levels between dry and rainy seasons. The temperature of groundwater was influenced by ambient temperature and was similar to reported values from previous works. The study has shown that pH of the groundwater in both dry and rainy seasons largely complied with TBS (2018) and WHO (2018) permissible limits. A comparison of parameters between sampling sites shows that pH of groundwater was lowest in residential areas than either dumping sites or petrol stations. Similarly, the electrical conductivity of groundwater largely satisfied TBS specifications but 67-83% of groundwater exceeded WHO limits. Electrical conductivity was highest in residential areas than either near petrol stations or dumping sites. While groundwater in the study area contains Cd, Pb, Cr, Cu and Zn, levels of Cd, Pb and Cr exceeded TBS and WHO standards in both seasons. Groundwater near petrol stations contained the highest levels of Cd and Cr while groundwater near dumping sites contained the highest levels of Pb. Despite largely satisfying TBS and WHO standards in Cu and Zn in groundwater, the population is exposed to negative effects from the metals, since the heavy metals bioaccumulate. Overall, groundwater contains non-permissible levels of Cd, Pb and Cr which affect quality of groundwater as potable water, making it unsuitable for human consumption. Principal Component Analysis has shown a correlation

exists among Zn, Cu and Pb; Cr, electrical conductivity & pH; and Cd & temperature. The existence of correlation indicates either variables originate from similar sources or mutual dependence.

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Utilisation of E-Government Services during the Covid-19 Pandemic: Exploring Efforts by the Government of Tanzania

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Abstract
This article attempts to examine the Tanzanian Government's utilisation of e-government services during the Covid-19 pandemic. The methodological approach of the article is online content review due to the phenomenological nature of the unfolding pandemic. The review is based on the researcher's observations and analysis of the e-government platforms leveraged in Covid-19 pandemic. The results indicate that e-government has been embraced significantly through the efforts done by the government to make citizens more informed about the pandemic and to promote use of e-services. E-government is presented as among the key tools for managing the spread of the pandemic. The article also paints government digital transformation as a huge opportunity provided by e-government during the pandemic and beyond. The article contributes to literature by presenting the significance of e-government to developing countries during crises including: government-wide online presence, quality information provision, G2C and G2G e-services, online engagement and social media presence. The review shows that collaboration and coordination among government entities are strategic techniques for an integrated and efficient digital government. Rightly so, the policy makers are recommended to strengthen inter-governmental collaboration and coordination in planning, developing, implementing and maintaining e-government services.

Keywords: *e-government, Covid-19, Tanzania, Public Administration*

INTRODUCTION

E-government has constantly been a significant endeavour in government/public management reform, especially in developing countries. Public sector digital transformation is keenly considered as key to achieve the many benefits of e-government (Cordella & Bonina, 2012). These benefits include reduced administrative burdens, improved public access to government services, increased efficiency and effectiveness of

the public sector, reduced corruption, creation of knowledge society, etc. (Angelopoulos, Kitsios, Kofakis, & Papadopoulos, 2010; Norris & Reddick, 2011; Johnson & Sieber, 2012; Al-Mamari, Corbitt, & Gekara, 2013; Asogwa, 2013). E-government has certainly become a necessity and not just an option for governments – a notion much more realised during the Covid-19 pandemic.

According to the UN, nearly 97.5% of Member States had put covid-19 related information in their national portals by 13th May 2020 (UNDESA, 2020). The information varied from general health information (such as Covid-19 symptoms, precautionary measures, emergency measures), Covid-19 statistics, policies and regulations (UNDESA, 2020). Several channels have been used by governments to report on Covid-19, including existing government websites (especially websites of ministries of health and hospitals), dedicated Covid-19 portals, social media, TVs and Radios. Other channels included pushed USSD messages and pictorial presentations in all government buildings. As the pandemic intensified, governments increased their efforts in ensuring that citizens have access to Covid-19 information at their fingertips. As such, digital platforms emerged as crucial tools in disseminating Covid-19 information to the wider mass. With massive dissemination of Covid-19 information, there has also been waves of disinformation and fake news; leading to infodemic. In response, WHO established an EPI-WIN platform (WHO Information Network for Epidemics) which provided trusted sources of information regarding the pandemic; including the MythBusters.

Digital solutions have become vital in addressing the recommended pandemic control measures as operations in the public and private sectors must continue. Governments around the world have been challenged to explore new digital solutions to engage stakeholders in providing and accessing e-services, providing clear information about the pandemic, etc. Undoubtedly, Covid-19 has shown how critical e-government is in building resilience in functioning of the governments. Acceleration of e-government solutions during the pandemic have allowed governments, academic institutions and businesses to continue functioning and, more importantly, to provide health and safety related information. The 2020 UN survey critically states that 'the way forward is a new "digital normal" in responding to global challenges and pursuing sustainable development' (UNDESA, 2020). The survey reveals that nearly 97.5% of Member States had their national portals as a key source for Covid-19

related information (Ibid.). To increase access to the right information while addressing misinformation and disinformation, some countries developed dedicated Covid-19 portals and used social media (Lin, Chang, Chou, & Chang, 2020; UNDESA, 2020). Recent research and surveys in e-government shows intensification of effective use of new technologies by governments to contain the pandemic – virtual doctors in Indonesia and Croatia, 3D printing technologies in Italy, TraceTogether App in Singapore, etc. (Ibad & Lolita, 2020; Ullah, Pinglu, Ullah, & Abbas, 2021; UNDESA, 2020). The use of e-government is thus considered as an ideal and effective solution for governments in managing the pandemic and beyond. High rise of digital transformation in the public sector has been observed in the healthcare, financial services and education sectors. In the following paragraphs, digital transformation in the mentioned sectors is briefly reviewed to depict the role of e-government during the pandemic. It is worth to note that this section highlights the acceleration of digital transformation and its positive impacts in the mentioned sectors as influenced by the pandemic. Nevertheless, the author understands that in each sector, there have also been negative impacts associated with increased risks in digital transactions, demarginalization of communities, etc.; but this perspective is not the focus of this research.

Digital healthcare systems have been greatly transformed by governments as among the means to manage the spread of Covid-19. The pandemic saw the resurgence of innovative healthcare techniques and tools. In Saudi Arabia, for instance, digital healthcare platforms that emerged are virtual healthcare, Covid-19 diagnostic platform and e-prescription platforms (Alharbi, 2021). In China, the e-health facilities were also greatly influenced by the pandemic with the rise of e-services such as e-consultation, tele-consultation, e-payment and e-registration for healthcare services (Wang, Sun, Liu, & Lai, 2021). Other examples are video-call consultations with healthcare providers observed in Bangladesh, Pakistan, Kenya and Nigeria; presence of hotline numbers for Covid-19 related issues (Ahmed, et al., 2020). More advance uses of innovative technologies to manage the pandemic were seen in India, where real-time dashboards, chatbots, smart-cities, video monitors and drones were used to geolocate the pandemic cases as well as to identify open pharmacies and to monitor hospitals' capacity (UNDESA, 2020). In China, the government developed a Health QR Code service to assess persons' health and determine whether, according to the assessment, the

individual should isolate at home or continue with daily routines (UNDESA, 2020).

The financial sector also saw a rise in digital transformation especially in developing countries. With social distancing rules becoming in effect in many countries, citizens opted for digital financial services to pay bills, groceries, shopping, etc. High rise of digital payment services was observed during the pandemic with increases in transaction volume, number of transactions and customers opting for digital services. The pandemic also prompted service providers to introduce new services and products to steer digital financial services. For instance, some firms introduced new online payment channels and others waived/significantly reduced fee/commission for performing digital financial transactions (CCAF, World Bank, & World Economic Forum, 2020, p. 56). In Sub-Saharan Africa, an increase of digital transaction volumes was highly observed in South Africa, Kenya, Nigeria and Uganda, where the survey was conducted (CCAF, World Bank, & World Economic Forum, 2020, p. 80). In a research report by the IMF, digital financial services are depicted as crucial in promoting social distancing and reducing the spread of the pandemic; as well as in keeping monetary transfer consistent (Agur, Peria, & Rochon, 2020). The latter was observed as significant in the informal sector, where small-scale businesses loomed due to the pandemic-related restrictions.

The education sector has also experienced considerable digital transformation in electronic/online learning (henceforth eLearning) due to the disruptions resulting from the pandemic (Nicola, et al., 2020). Schools, colleges and universities that were not offering eLearning in pre-Covid-19, made considerable shifts in their structures. Education providers, especially in higher learning, have been highly influenced to adopt eLearning to minimise loss of instruction time. Adoption of eLearning has also received considerable attention from governments through strengthened eLearning support measures in universities, colleges and schools. For instance, the Italian government equipped schools with digital platforms, supplied devices to less well-off students and trained instructors in eLearning pedagogies (Schleicher, 2020). The Indian central and state governments strengthened existing ICT infrastructure in response to new demands on eLearning; new initiatives that emerged included the National Repository of Open Educational Resources (Singh, Adebayo, Saini, & Singh, 2021). The Chinese government instructed a

"quarter of a billion full-time students to resume their studies through online platforms", resulting in the huge rise of the Tencent online classrooms in the country (Li & Lalani, 2020). These are just the fewest examples demonstrating the governments' responses to Covid-19. The massive adoption of eLearning has also presented the education sector with innovative and sophisticated technologies to support teaching and learning. Tools/technologies that have largely been used during the period include online platforms (for informal and formal learning), virtual classes/lectures, TV broadcasts, radios and telephone lines (Schleicher, 2020). The pandemic also saw the rise of tech-giants offering online collaboration platforms, with some offering special licence packages for public and private education institutions; including Zoom, Coursera, Google Classroom and Google Meet.

As Covid 19 is still critical in many countries, research on how countries leverage e-government services specifically geared towards managing the pandemic and challenges that arise remains essential. This paper contributes to the existing knowledge by examining how the Government of Tanzania utilised e-government services during the covid-19 pandemic, especially in the healthcare, financial and education sectors. The objective of this paper is twofold: (1) to discuss the application of e-government services during the pandemic and (2) to shed light on the challenges arising in utilising e-government. To achieve the objectives, content analysis of secondary digital sources was adopted as well as researcher's observations on on-going e-government initiatives during the pandemic.

The paper is organised as follows: section 2 presents the methodology followed by the findings and discussion in section 3. Finally, section 4 presents conclusion and recommendations.

METHODOLOGY

Generally, this study has adopted a qualitative research approach. This method is commonly used for detailed description and comprehensive exploration of a process (Williams, 2007). The focus of this research is to explore e-government related services adopted by the Tanzanian government in efforts to manage Covid-19 pandemic. For data collection, the study adopted online content review based on researcher's observations of e-government practices adopted by the government, particularly between March 2020 and January 2022. Content analysis is a detailed examination of an existing body of materials to identify issues

and draw conclusions that addresses the research objectives (Williams, 2007). Content analysis is a two-step process: identification of the body of materials to be studied and presentation of themes/patterns emerging from the analysis.

The researcher acknowledges the biases that arise with this method; however, this method seemed appropriate with the ongoing pandemic-related cautions. Errors were largely minimised to increase reliability of results by triangulating the same information from different sources of data. All public institutions' online presence during the pandemic was reviewed to examine the e-services that were specifically triggered by the pandemic. The key sources of data used during the research include: the website of the Ministry of Health (www.moh.go.tz) and websites of relevant public institutions as presented in the next section.

FINDINGS AND DISCUSSION

This section provides empirical insights into the application of e-government services during the pandemic in Tanzania. The findings are drawn from data obtained from two (2) official central government websites and social media platforms, and seven (7) public institutions. Online review was mapped from relevant document review and is presented in three sectoral categories: digital healthcare, digital financial services and digital education provision.

In Tanzania, the pandemic has caused significant disruptions particularly in health, education and financial sectors. On 16th March 2020, the Government of Tanzania (Mainland) through its Ministry of Health, Community Development, Gender, Elderly and Children confirmed the first case of Covid-19 that had struck a Tanzanian traveller from Belgium[1]. In Zanzibar, the first case of Covid-19 was confirmed on 18th March 2020. On 31st March 2020, the first Covid-19 death was reported in Tanzania by the Government. In May 2020, the Government suspended reporting Covid-19 situation; whereas, the statistics stood at 509 cases and 21 deaths. To date, Tanzania has recorded 33,620 confirmed Covid-19 cases and 798 deaths[1]. On 17th May 2020, the Government of Tanzania submitted the necessary documents to join the COVAX programme, and administration of Covid-19 vaccine started on 6th July 2021 and 28th July 2021 in Zanzibar and Tanzania (mainland)

[1] Covid-19 (moh.go.tz) Last accessed 24th February 2022

respectively. To date, 4.07 Covid-19 vaccines have been administered per 100 population in Tanzania. All the while as the pandemic struck, several health precautions have been taken by the Government of Tanzania. For instance, during the announcement of the first Covid-19 case on 16th March 2020, citizens were urged to take precautionary measures including avoid crowded places, wash hands frequently, use hand sanitizers and limit touching of face just to mention a few. Travellers were also warned of limiting unnecessary travel to Covid-19 struck countries. In addition, hotels, schools, universities, shops and supermarkets, churches, mosques, public and private offices, markets, sports stadiums, and bus stations were urged to ensure availability of soap and running water for washing hands, as well as hand sanitizers. Although wearing of face masks has not been mandatory in Tanzania, citizens have been urged to wear the masks as one of the Covid-19 precautionary measures.

a) Digital healthcare

The healthcare sector was the most affected sector by the pandemic. Considerable efforts were needed to manage the pandemic on the one hand, and to manage the effects of the pandemic in general healthcare provision on the other hand.

Pre-Covid-19, the central government has had its presence on the internet – through official websites and social media platforms. As reported earlier, the first Covid-19 case in Tanzania was reported on 16th March 2020. Beforehand, the government used its online outlets (website www.moh.go.tz and social media platforms) to inform citizens concerning the pandemic. For instance, on 29th February 2022, the Minister of Health informed citizens concerning the progress of the pandemic worldwide and that there was no Covid-19 case in Tanzania at the time via the Ministry's Instagram account – wizara_afyatz. The social media platform was heavily used by the Ministry of Health during the pandemic to provide accurate information regarding Covid-19 pandemic progression. The platform was also used by the Ministry to educate citizens on recommended healthcare measures including frequent use of sanitizers and washing of hands with running water and soap and social distancing. The Ministry also used its online presence to counteract fake news (ref. Figure).

Figure 1: Excerpts from the Ministry of Health Instagram account

To proactively collect information on the ongoing pandemic, the Ministry provided health emergency numbers that citizens could freely use to update the government on individuals affected by the virus – 0800110125/0800110124/0800110037, of which the numbers were later changed to 199. In regards to travellers, the Ministry developed a Travellers' Health Surveillance System (www.afyamsafiri.moh.go.tz). The system was developed for travellers wishing to enter Tanzania to have quick access to Covid-19 services including online payment to Covid-19 test, online results to the tests, as well travel guides provided by the Ministry.

Since joining the COVAX facility on 17th May 2020, the Ministry developed two online systems for effective administration of the vaccines. First, the online system for booking for Covid-19 test (www.pimacovid.moh.go.tz) has two (2) functionalities: (1) to allow anyone to book for Covid-19 test, and (2) to receive e-certificate for Covid-19. Second, the online system for requesting/registering for Covid-

19 vaccine (www.chanjocovid.moh.go.tz) allows anyone to request the vaccine at any approved health centre listed in the system as well as request for vaccination e-certificate. In addition to the systems, the Ministry heavily used its social media platforms to educate citizens about the vaccine, urge them to receive the vaccine and counteract a wave of misinformation regarding Covid-19 vaccination.

Major online service provided by public hospitals is the use of their online presence (website and social media platform) to educate citizens on the pandemic and recommended healthcare measures, e.g., social distancing, new regulations on hospital visits, use of sanitizers and handwashing facilities present in hospital premises. Such information could be found on websites of Muhimbili National Hospital (www.mnh.or.tz), Amana Regional Referral Hospital (www.amanarrh.go.tz), Dodoma Regional Referral Hospital (www.dodomarrh.go.tz), and other public hospitals with websites and social media platforms.

b) Digital financial services

Since the start of the Covid-19 pandemic, digital financial services have been seen as a safer alternative to cash. In Tanzania, long before the pandemic, adoption of digital payment had gained massive popularity, especially in the mobile money market. According to the statistics published by the Tanzania Communications Regulatory Authority's between 2019-2021, there is considerable increase in subscriptions to mobile money and usage of internet from approximately 25M to 35M (ref. Figure 2).

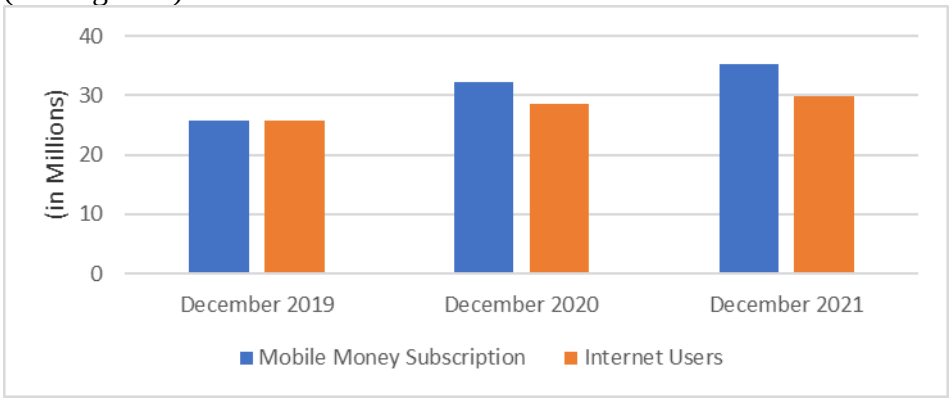

Figure 2: Trends on Mobile Money Subscription and Internet Users 2019-2021 (***www.tcra.go.tz***)

Online payment of government services has existed in Tanzania for more than five years. In 2017, the Government launched the Government Electronic Payment Gateway (GePG) – a centralised system of all government revenue collection channels (www.gepg.go.tz). The system facilitates electronic money transactions for citizens and businesses using mobile phones (via USSD and Mobile Apps). The system's role in providing citizens and businesses a convenient transaction gateway with the government has been cemented during the pandemic as it allowed citizens to pay their bills using their mobile phones at their own convenience while adhering to recommended health measures.

c) Digital education delivery

Undoubtedly, with closure of academic institutions due to the pandemic, eLearning has emerged as a necessity to reduce its impacts. As presented in section 2, eLearning was heavily promoted by international, regional and national bodies as the pandemic progressed. Similarly, in Tanzania, the widespread adoption of eLearning by academic institutions and service providers could be observed from public and private entities.

The initial reaction of the Government in response to the pandemic, was to close all schools, colleges and universities for one (1) month from 17th march 2020 (the notice was published by the Ministry of Education, Science and Technology (MoEST) via its social media platfrom wizara_elimutanzania). To reduce the impact of missed learning hours, especially to schoolers, on 22nd April 2020, the government encouraged schools to use TVs and Radios as educational tools. The form VI students were especially emphasised to follow up on dedicated learning hours on government-owned Tanzania Broadcasting Corporation (TBC) as they prepared for the national examination in mid-2020. Subjects offered online include physics, economics, Kiswahili, geography, mathematics, chemistry and history. On 21st May 2020, all universities, colleges and schools were instructed to resume conventional education from 1st June 2020 (Instagram: wizara_elimutanzania). From then on, the Ministry used its social media platforms and website (www.moe.go.tz) to educate all citizens on Covid-19 and recommended healthcare measures to contain the pandemic. Similar to the Ministry of Health, the MoEST also used its social media presence to advise schools, colleges and universities to ensure that the recommended healthcare measures are observed. On 4th July 2021, the MoEST released a public notice which directed schools, colleges and universities to adhere to the recommended healthcare

measures but also encouraged them to use ICT to reduce the spread of the pandemic.

Digitization efforts in provision of education in Tanzania includes the freely available online library provided by the Tanzania Institute of Education (see www.tie.go.tz). Through its social media account (Instagram account: taasisiyaelimu), TIE is quoted "due to the closure of schools and students directed to stay at home, TIE freely provides online library services. The library offers publications that are based on updated curricula".

The significance of eLearning during the pandemic could particularly be observed in higher learning institutions. This paper draws experience from the Open University of Tanzania (OUT) (www.out.ac.tz). According to the well-known universities ranking web Webometrics (2021), the OUT ranked 16th out of 159 online universities worldwide, 1st out of 15 fully fledged Open Universities/HLIs in Africa, excluding those that offer dual modes of learning. The OUT is the only university in Tanzania that is a fully fledged online and distance learning university. As mentioned earlier, all schools, colleges and universities were directed to close at the beginning of the pandemic in Tanzania. During the closure, the OUT was the only university that remained open and continued to offer teaching and learning services. The university leveraged on eLearning management system (Moodle) and audio-visual collaboration tools for synchronous and asynchronous teaching and learning activities. Before the pandemic, the use of Zoom at the university was not cemented and education delivery was mainly through Moodle. During the pandemic, the OUT invested in Zoom for education licences to strengthen education delivery. For examinations, the OUT developed an innovative oral examination system known as OREX, which is the 1st system to be used in Tanzania for a similar purpose (The Open University of Tanzania, 2020). The OREX system integrated an online platform and audio-visual collaboration tools (Ally & Oreku, 2022). The software platform connected two examiners, an observer and a student to an examination session. The three parties would be joined together to an online session via Zoom for the oral examination; whereas, the links to the Zoom sessions were created by the examiners at least a day before the session (Ibid.). Several rules and regulations were observed during the examination such as presentation of student ID card, presentation of the environment where the student was located, all to always turn on their

cameras during examinations, etc. (Ibid.). OREX allowed the university to continue with its core functions while observing the strict Covid-19 measures as each student, examiner or observer could attend the examination sessions wherever they were.

The presentation in this section certainly highlights that e-government has also been embraced significantly during the pandemic. The efforts done by the government to make citizens more informed about the pandemic and to promote use of e-services are also positively considered. In the next section, policy implications of the article are reflected and conclusions are presented.

CONCLUSION AND RECOMMENDATIONS

The objective of this article was to highlight the Tanzanian government's embrace of e-government practices during the Covid-19 pandemic. The findings from the review of government websites show that there are even more opportunities presented by e-government during the pandemic and beyond. Accordingly, it is the function of the government to ensure that these opportunities are taken upfront. It is noteworthy to acknowledge that despite the presented efforts, the government and citizens still experience considerable challenges in providing and accessing/using e-government services, respectively. These challenges are such as inadequate ICT infrastructure, financial constraints, network accessibility barriers, etc. (Mkude, 2016). Nevertheless, the government must, now more than ever, review its e-government strategies, programmes and projects. The recommended foci are to identify critical enablers of e-government as well as e-services. In this way, the pandemic or not, the government will still be ahead in digital transformation of socio-economic sectors. Furthermore, the review in this article has shown that collaboration and coordination among government entities are strategic techniques for an integrated and efficient digital government. Rightly so, the policy makers are recommended to strengthen inter-governmental collaboration and coordination in planning, developing, implementing and maintaining e-government services.

This article concludes that even the basic e-government practices including government-wide online presence, quality information provision, G2C and G2G e-services and online engagement and social media presence significantly cements the need for further government digital transformations. The article provides opportunities for future

research in empirical examination of the impact of e-government during the pandemic in perspectives of the government, citizens and businesses.

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Role of Communal Consumptive Natural Resources Management Approach in Addressing Community Economic Benefit in Western Tanzania

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Abstract
The role of consumptive natural resources management in addressing community economic benefit in West Tanzania is much likely less known. This study was carried out to assess the impact of communal consumptive natural resources management on community economic benefit. A four-point numerical scale survey questionnaire was administered to 400 respondents, and an interview guide was administered to 40 Key Informants. Quantitative data were analyzed by SPSS, while qualitative data were analyzed by Excel framing summarizing technique. The research findings indicated that communal consumptive natural resources management had a close to strong correlation and significant positive impact on community economic benefit (CEB). The linear relationship between the communal natural resources management approach and community economic benefit (CEB)Pearson (r) covariance statistical relationship correlation coefficient result was Pearson -r (733) = .73, p<.001. The positive Pearson (r) above 0.7 implied that the relationship was a strong correlation. The impact of the communal natural resources management approach on community economic benefit (CEB) was calculated through multiple linear regression. Multiple linear regression coefficient B= 1.43 at 95% confidence interval (CI) = 1.34, 1.53; p=0.000. The result implied that an increase of one unit of the communal consumptive model was associated with a positive increase of 1.43 CEB. The positive increase in CEB suggests that the communal consumptive natural resources management approach significantly impacts community economic benefit (CEB). It is recommended that to maximize community economic benefit (CEB), communal consumptive natural resources management approaches should be focused on and given significant attention. Moreover, to maximize community economic benefit (CEB), an integrated hybrid combo of consumptive approaches such as sustainable timber, and non-consumptive approaches such as avoided deforestation and increased sequestration carbon credit is recommended for terrestrial natural resources management in western Tanzania.

Keywords: *Natural resources management, community economic benefit (CEB), communal-indigenous natural resources management, natural resources utilization, Greater Mahale Ecosystem (GME), Tanzania*

INTRODUCTION

To bring a balance between economic benefit and natural resources management has been on the world agenda (UNEP-WCMC, 2018; Andika, 2020; Keane *et al.,* 2020; COP 26, 21). Target 11 of the Aichi meeting states, "Protected areas are effectively and equitably managed" (CBD, 2011). Equitable management includes fair distribution of economic benefits (CBD, 2011). Regardless of the importance of economic benefits that can be accrued from conservation interventions, fewer studies have been conducted on conservation economic benefits (UNEP–WCMC, 2018). Following a few conducted studies, UNEP–WCMC (2018) report calls for assessing the flow of economic benefit from conservation as a priority. The economic benefit gained to the community from communal-indigenous natural resources management approaches is the interest of this paper.

Community economic benefit (CEB) is a broad term, however, in this study, the term gain is adopted as it is defined by The Millennium Ecosystem Assessment – MEA (2005). The MEA (2005) defined community economic benefit as "the gains people obtain from ecosystems". In this study, community economic benefit means all gains and opportunity costs people received or incurred from nature. Community economic benefit accrued from forest and wildlife natural resources management approaches in Greater Mahale Ecosystem was studied. The studied community economic benefits were either through government-state natural resources management or communal–indigenous management. The Greater Mahale Ecosystem (GME) in Western Tanzania practices government-state and communal–indigenous forest and wildlife management approaches and is among vulnerable degrading biological hotspots (Leisher and Hess, 2017; William, 2018). The study focused on forest and wildlife terrestrial resources management because they are the ones highly affected by land domestication and conversion (Piel *et al.,* 2013; Steffen *et al.,* 2015; Leisher and Hess, 2017; William, 2018). However, this paper will only limit itself to communal-indigenous consumptive natural resources management. The reason for limiting the paper is that natural resources management is broad;

therefore, it is challenging to attempt to address all approaches in one paper.

Management of terrestrial natural resources, specifically forests and wildlife in Tanzania and the Greater Mahale Ecosystem, has been either through government or communal approaches before and after independence (URT, 1998a; URT, 1998b; TAWIRI, 2018). Terrestrial natural resources management is either consumptive or non-consumptive (TAWIRI, 2018). Communal natural resources management is stipulated in the wildlife policy of Tanzania (URT,1998a) strategy as "involving rural communities and other stakeholders in taking joint responsibility for the sustainable management of wildlife and other natural resources". The wildlife policy also states, "to transfer management of Wildlife Management Areas (WMA) to local communities thus taking care of corridors, migration routes, and buffer zones and ensure that local communities obtain sustainable, tangible benefits from wildlife conservation. Furthermore, the forest policy of Tanzania (URT,1998b) stipulates communal forest management in the sixteenth policy statement, which states that "Biodiversity conservation and management will be included in the management plans for all protection forests. Involvement of local communities and other stakeholders in conservation and management will be encouraged through joint management agreements". However, the joint management mentioned shows that communities will be involved and not fully control natural resources. Additionally, on communal forest management, the forest policy of Tanzania (URT,1998b) thirty-ninth policy statement states that "local communities will be encouraged to participate in forestry activities". Although the two types of natural resources management, which are government and communal approaches, have been mentioned in the cited policies, the community economic benefit was not clearly stated.

Wildlife and forest policies had few statements on economic benefit (URT, 1998a; URT, 1998b). The wildlife policy of Tanzania (URT,1998b) states that "The policy will continue to give wildlife economic value to rural communities to enhance rural redevelopment without prejudice to the environment, and in such a way that the benefit compensates for the opportunity cost of this form of land use". While the forest policy of Tanzania (URT,1998b), third policy statement states that "to enable participation of all stakeholders in forest management and conservation, joint management agreements, with appropriate user rights

and benefits, will be established." Such stated benefit did not specify how communities from natural resources management can accrue the economic or financial benefit. While economic benefit is a crucial point to be discussed in natural resources management, the how and access controls of regenerative natural resources are also crucial to avoid resource over-exploitation.

The study was pinned down by the optimal control theory that focuses on optimization. The theory states that in a normal undisturbed system, a situation trajectory $x(t)$ for all $t \geq t0$ is determined by initial data ($t0$, $x0$). Whereas, known initial state $x(t0) = x0$ are all function of time $t \geq t0$ and mathematical are $\dot{x}(t)=f(tx(t))$ (Weber, pp. 81-148, 2011). This meant that a decision maker's actions might influence the state's trajectory. Such actions include control over the dynamic process and can change the system flow (Moyo *et al.*, 2017). Optimal exploitation is attained at the climax of "n", a function of resource exploitation and development (Barber, 2007). Moreover, it is also accepted that natural resources should be controlled and regulated for sustainability (Lewis *et al.*, 2017). Such controls and regulations that optimize utilization have benefited the community economic benefit in some countries. Improved natural resource conservation and investment approaches have benefited the economy of Malaysia, Costa Rica, and Thailand (Scherl *et al.*, 2004; Andam *et al.*, 2010; Amira *et al.*, 2015).

There are substantial research and studies on the management of natural resources and the economy (Andam *et al.*, 2010; Amira *et al.*, 2015; Steffen *et al.*, 2015; Lewis *et al.*, 2017; Moyo *et al.*, 2017; Andika, 2020; Keane *et al.*, 2020). However, none of the studies dealt with specific natural resources management approaches impacting community economic benefits. This literature gap failed to address a continuously conflicting school of thought on a better natural resource management approach between government-state and communal-indigenous. The conflicting school of thought is also between consumptive and non-consumptive conservation approaches. Moreover, it is crucial to have sustainable utilization of natural resources that reduces resource degradation trends and address the community economy in this decade that faces severe climate change (Andika, 2020; COP 26, 2021). This study was carried out to address that literature gap and attempt to clear the two conflicting schools of thought. The study focused on determining the impact of different terrestrial natural resources management (TNRM)

approaches on community economic benefit (CEB) in Greater Mahale Ecosystem in western Tanzania. Specifically, this paper which is part of the study examined the impact of consumptive communal-indigenous natural resources that are forest and wildlife management approaches on community economic benefit (CEB) in Greater Mahale Ecosystem in western Tanzania. After that, a research-specific null hypothesis (H_1) was developed. H_1: Communal-indigenous consumptive terrestrial natural resources management approach did not have a statistically significant impact on community economic benefit.

METHODOLOGY

The study area

The research was carried out in western Tanzania within the Kigoma and Katavi regions, which form a large part of the western ecoregion (John *et al.*, 2019). This is where Greater Mahale Ecosystem (GME) is geographically positioned (TAWIRI, 2018), as seen in Figure 1. The area is a landscape that covers 18,200 km2 sited at Latitude 50.30' - 6^0.29' South and Longitude 29^0.43' - 30^0.37' East (Coulter, 1994). The area is within Lake Tanganyika basin or Congo headwater basin with Zambezian woodland ecoregions which provide a beautiful natural view (John *et al.*, 2019). The area is rich in biodiversity and is one of 34 world biodiversity hotspots (TAWIRI, 2018). Greater Mahale Ecosystem receives a unimodal rain season from November to April and a dry season from May to October (TAWIRI, 2018).

The Population in Greater Mahale Ecosystem is about 500,000 native Ha, Bembe, Fipa, Konongo, Pimbwe, Galla, Nyakarema, and Tongwe. The area has a fast-growing population of 4.8%, with poor-performing economic welfare of less than 150 USD per year per household (URT, 2012; Leisher & Hess, 2017; Hardee *et al.*, 2018). Social-economic activities depend heavily on natural resource utilization, including fishing, farming, and forest production (Leisher & Hess, 2017; Hardee *et al.*, 2018). In addition, some socio-economic activities are business, hotel, and tourism (Leisher & Hess, 2017). The fast-increasing population and the heavy dependency on natural resources exert pressure on natural resource utilization which is linked to natural resources management approaches.

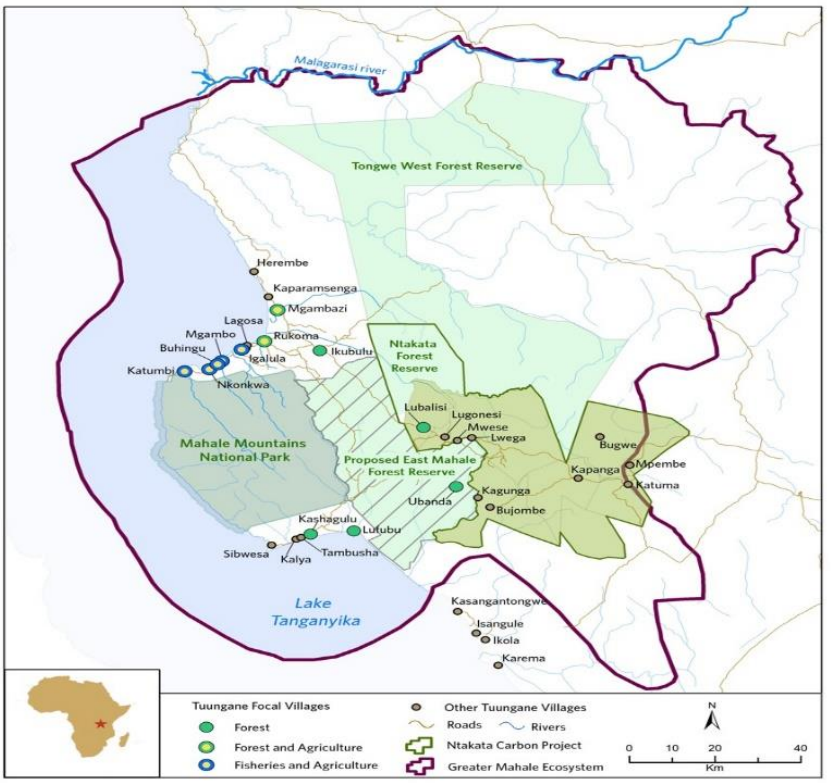

Figure 1. Map of Greater Mahale Ecosystem
Note: The light blue is part of Lake Tanganyika in the Greater Mahale Ecosystem

Methods

The research applied constructivist philosophy that combined empirical, expertise, and positivist approaches concurring with Novikov & Novikov (2013). Additionally, the research applied interpretivism of reviews on expert knowledge. The combined philosophy aimed to improve research quality, as it is suggested by Gravetter & Forzano (2012). The research strategy applied a four-point scaled survey questionnaire to collect data from 400 respondents in 10 villages around the Greater Mahale Ecosystem seen in Figure 1. The villages were around national parks, government forest reserves, wildlife hunting blocks, wildlife corridors, and communal forests. Sampled villages were Mwese, Lwega, and Lugonesi Kasenganyama, Kasangantongwe, Kasekese, Buhingu, Mgambo Katumbi, and Nkokwa.

Conservation- Economic benefit modeling and data processing

The study-specific objective was to examine the impact of the communal-indigenous consumptive terrestrial natural resources management approach on community economic benefit (CEB) in the Greater Mahale Ecosystem in western Tanzania. The study developed and tested a specific null hypothesis (H_1). H_1: Communal-indigenous consumptive terrestrial natural resources management approach does not significantly impact community economic benefit.

Mathematically, community economy benefit (CEB) is the summation of economic gains and value (EV) and is the function (f) of the terrestrial natural resources management approach (TNRM). The mathematical statement can be represented as follows: -

$$CEB = \sum(EV) \text{ and } CEB = f(TNRM) \quad (1)$$

Because the terrestrial natural resources management approach (TNRM) is the summation of resources utilization (RU) and natural resource controls and development (CD), then it can be written as: -

$$TNRM = \sum (RU, CD) \quad (2)$$

Reading together equation 2 and equation 1, and combining the two, mathematically, it is correct to state that community economy benefit (CEB) is a function (f) of resources utilization (RU).

$$CEB = f(RU) \quad (3)$$

Whereby resources utilization (RU) is composite of communal consumptive (CCT), communal non-consumptive (CNC), government consumptive (GCT) and government non-consumptive (GNC) resources utilization.

$$RU = \sum (CCT, CNC, GCT, GNC) \quad (4)$$

Therefore, substituting the first RU composites of CCT in equation 4 to equation 3, will produce the following equation: -

$$CEB = f(CCT) \quad (5)$$

Because communal consumptive (CCT) natural resources utilization is a composite of community tourism hunting (THC), farming near the conserved area (FMC), access to meat and fruits for food (MFC),

firewood collection (FWC), access to medicinal plants and wildlife (MDC) and logging and timbering (LGC), therefore equation 5 can be expanded as follows: -

$$CEB = f\ (THC, FMC, MFC, FWC, MDC, LGC) \quad \text{.....(6)}$$

The composites in equation 6 can be termed as $X_1, X_2, X_3 \ldots\ldots X_t$. The composites have constant regression terms to be generated or estimated $\beta_0, \beta_1, \beta_2, \beta_3 \ldots. \beta_t$, whereby β_0 = Regression coefficient, which is Y (CEB) value when all X (CCT) values are zero. When random error term of ε is applied, then equation (6) can be re written as follows:

$$CEB = \beta_0 + \beta_1 X_1 + \beta_2 X_2 + \beta_3 X_3 + \ldots\ldots\ldots + \beta_t X_t + \varepsilon i \quad \text{.....(7)}$$

And therefore, equation 7 can be re-written as follows: -

$$CEB = \beta_0 + \beta_1 THC + \beta_2 FMC + \beta_3 MFC + \beta_4 FWC + \beta_5 MDC + \beta_6 LGC + \ldots \varepsilon i \quad \text{.....(8).}$$

Equation (8) is the model of communal-indigenous consumptive natural resources management (CCT) – community economic benefit (CEB) in this study. Equation (8) was used to compute the impact of communal-indigenous consumptive natural resources management approaches on community economic benefit.

The research used Statistical Package for Social Scientists (SPSS) to analyze quantitative data. Data were coded; variables were given numerical scales, and their values were entered into SPSS. Descriptive statistics, statistical correlation, and multiple linear regression techniques were used to test statistical relationships between communal consumptive (CCT) resource management approaches and community economic benefit (CEB). In addition, the Excel framing method conducted and summarized qualitative KII to triangulate and complement quantitative statistical information.

Stevens (1996) used multivariate statistics for social sciences studies to select sample size. The study chose Stevens (1996) because it is a suitable method of calculating sample size when the study has many independent variables. The study used the largest independent variable (m) to determine the minimum sample size (N) by applying Stevens (1996) formula of N= 50 +8m for multiple linear regression (Stevens, 1996). In

studying community economic benefit, which was a dependent variable, there were 19 independent variables. Independent variables were resources control and development (5), consumptive utilization (6) and non-consumptive utilization (8). Therefore, Stevens (1996) minimum sample size (N) = 50 + (8 X 19) =202. However, the study opted to take 400 sample size, which is bigger than 202. Making the sample size larger than Stevens' calculated sample size is because the larger the sample size, the smaller the effect can be detected, while small samples can detect a large effect size. The research wanted to ensure the detected impact size was not contributed by a small sample size.

Furthermore, Multicollinearity statistical pair-wise correlation tests among variables were performed in line with Gujarati (2004) and found out that there were no multicollinearity effects. Cronbach Alpha was also computed for testing the instrument's reliability. Cronbach Alpha were 0.7 and above and therefore, were accepted as commonly considered good and acceptable for reliability and internal consistency of variable relations (Almquist *et al.*, 2019).

RESULTS AND DISCUSSION

Impact of communal-indigenous consumptive natural resources management on community economic benefit

Greater Mahale Ecosystem applies a communal-indigenous natural resources management approach, among others. Consumptive utilization of natural resources, mainly forests, and wildlife resources, included hunting tourism, access to timber, firewood, wild game, wild fruits, and access to medicinal trees and wildlife. Communal-indigenous natural resources management consumptive utilization impacted the community economy with a mean of 31.17 (Table 1), which was slightly below the average of a strong mean of 33. The data suggested a relatively close to the strong relationship between communal-indigenous consumptive natural resources management and community economic benefit. Close to strong communal-indigenous consumptive natural resources mean was associated with poorly developed infrastructure and attested by interviewed people. For example, one interviewed natural resources government officer employed in one district around Greater Mahale Ecosystem for more than ten years; when asked about communal-indigenous consumptive utilization economic benefit, his response was:

> *"Community have weak governance and cannot make strong resources extractive plans", he added "community cannot develop road infrastructures even to places*

> *where they wish to extract resources",* he completed by saying, "*therefore, community cannot realize tangible consumptive natural resources benefit without support of district government".*

Among reasons that cause less impact of consumptive communal natural resources management on economic benefit were poor road network and accessibility. One interviewed trained forest patrol young man when asked about the economic benefit gained from the communal consumptive approach, showed concern by saying:

> *"We receive few hunting tourists, and it is difficult to sell our timber at a good price because our villages are remote with less developed road infrastructure".* He added, "*Our hunting blocks are also poorly functioning because of poor roads, hunting tourists do not prefer to come to our area".*

The findings on infrastructure challenges and remoteness align with Huton *et al.* (2005), who showed that channels of gains in economic benefit face barriers and boundaries. Such barriers include accessibility like what is experienced in Greater Mahale Ecosystem.

Table 1: Communal-indigenous consumptive natural resources management variables

Variables-composites	Calculated Mean	Std. Deviation	N	Estimated strong mean
Communal consumptive	31.17	11.858	733	33
Hunting tourism	3.23	1.521	733	3
Farming	7.23	2.737	733	7
Meat and fruits	5.07	2.316	733	5
Firewood	5.78	2.488	733	5
Medicinal	4.59	2.068	733	3
Logging and timbering	5.27	2.359	733	5

Note: N=733.

Hunting tourism in conserved communal forests and wildlife-managed areas

The impact of communal-indigenous hunting tourism on the community economy in and around communal forests, wildlife corridors, and wildlife dispersal areas computed mean in Table 1 was 3.23. The studied mean was just above the average strong mean of 3. The data suggest the existence of a strong relationship. The numbers insinuate that hunting tourism is also happening in the community-managed blocks. However, the majority (75.3%) and (62.8%) disagreed that hunting blocks are active and hunting quota permits are issued, respectively (Figure 2). The

quantitative findings speak the same language as qualitative interview opinions. One elderly respected person in one lower village of the area, which is not participating in avoided deforestation carbon credit business, was interviewed. When he was asked about the performance of hunting blocks in community lands, he had reservations and hesitation on whether they benefit economically. He cited and mentioned Lyamgoloka, which is a wildlife corridor connecting Mahale Mountain National Park and Katavi National Park, by saying:

> *"Setting aside land for hunting blocks is not promoting our community economy because there are no hunting tourists. We do not receive money for conserving our communal land for hunting.* He added, *for example, I do not know how much money and benefit we get for conserving Lyamgoloka".*

The finding and feeling call for enhanced resource utilization that addresses community economic benefit, which concurs with Keough and Blahma (2006) and Russel et al. (2018) argument that resources should be in community custodianship to be utilized in a more rewarding way.

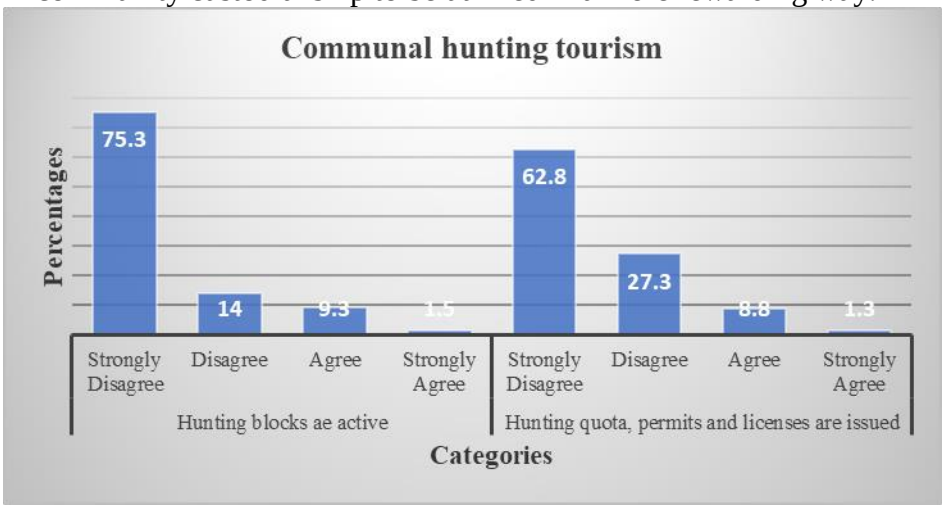

Figure 2: Hunting tourism in communal-indigenous conserved areas

Farming near communal conserved forests and wildlife management areas

The impact of farming near communal forests and wildlife corridors on the community economy under the communal-indigenous natural resources management approach was slightly strong, with a computed mean of 7.23 (Table 1). The studied mean was just a slight 0.23 points above the strong average mean of 7. The data suggests not a very strong impact. Most respondents (75%) strongly disagreed that farming near

conserved communal areas such as forests and wildlife corridors produces more harvest (Figure 3). More than half of the respondents (63%) disagreed on whether enough water is available for farming.

Furthermore, nearly half (43%) of respondents disagreed that they receive good farm gets price and 44% disagreed that crops destroyed by wildlife are compensated (Figure 3). Again, this was a skewed finding with a majority disagreement. This finding suggests pessimism for conservation on the acceptance of land use for agriculture.

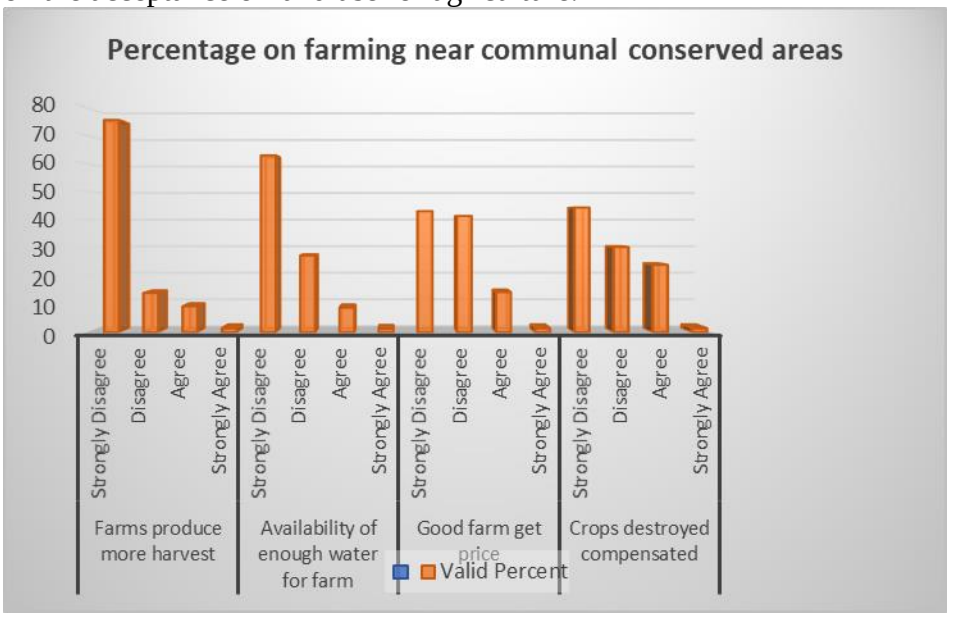

Figure 3: Farming near a communal – indigenous conserved area

Game and fruits access in communal conserved forest and wildlife areas

Conservation impact on community economic benefit was studied through the availability and access of meat–wild game, and fruits for use in the communal-indigenous managed resources approach. Studied natural resources included communal forests and wildlife corridors with a computed mean of 5.05 (Table 1), almost close to an average strong mean of 5. Respondents who disagreed on the availability of enough fruits for selling were 63.5%. More than half (63%) disagreed with the access to enough fruits for food, and 74% disagreed with the availability of enough bush meat (Figure 4). The quantitative finding suggests that the community relies less on wild game and wild fruits for food or business

such as for sale. Interviewed people confirmed the information. For example, one elderly Tongwe tribe man, when asked about access to fruits and wild game, he said: *"There is enough food in our community and traditionally we do not depend on wild fruit and bush meat for food. We normally do not hunt wild games like newcomers to our land"*. Furthermore, one government official from one district of the Greater Mahale Ecosystem, when asked about community access to wild fruit and wild games for food, he said:

> *"Our region is among of country food basket regions, and we always have a good agricultural harvest. People less rely on wild fruit and meat.* He added, *although we opened wild game meat butcher in some towns like Mpanda, most people who purchase that meat are not indigenous people".*

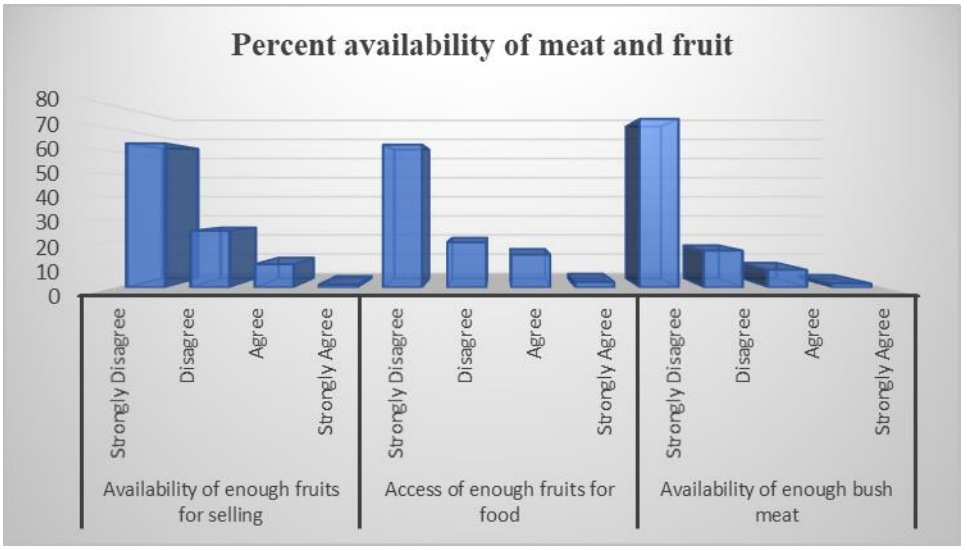

Figure 4: Availability of fruits and meat in conserved communal areas

Firewood and timber access in communal managed forests

The impact of access to firewood and energy from communal-indigenous managed natural resources approach on community economy computed mean was 5.78 (Table 1), slightly above the average strong mean of 5. The mean was not a very strong mean. The data suggested that the community depended less on the communal forest to access firewood. Interviewed people confirmed the information. An interviewed older woman in one of the area villages, when asked about access to firewood for energy, said:

> *"There are enough trees for firewood in our village. We get firewood from our farms and other non-conserved forests that are general lands and not from conserved forests".*

The impact of logging and timbering on the community economy computed mean was 5.27 (Table 1), just 0.27 points slightly above the average mean of 5. The findings suggested less economic benefit from logging and timbering in communally managed forests. Interviews confirmed the finding. One respectful person on the shores of Lake Tanganyika had this to say when interviewed on forest logging and timbering communal conservation benefits: *"Our community benefits from our forests by accessing timber and logs".* However, he had a different opinion by saying, *"The timber and logs are not for sell rather for community development works such as making school desks".*

Moreover, one interviewed a young man at one of Ntakata villages who hesitated that they access timber in the communal forest, saying: *"We benefit by accessing building timber and poles from our forests, even though most time we harvest poles for building in non-conserved forests".* The findings show that communities benefit from conserving their natural resources in different ways. Those benefits likely enhance conservation value which concurs with Tchakatumba *et al.* (2019) conclusion, which showed that when the community benefit from conserved resources will value the resource.

Medicinal trees and wildlife access in communal managed forests

The impact of medicinal plants and medicinal wildlife access on the community economy was highly valued in Greater Mahale Ecosystem. The medicinal benefits computed mean in communal managed natural resources approach was 4.59 (Table 1), which was the strongest mean, 2 points above the average expected mean of 3. Medicinal benefits include access to and use of different trees and wildlife to cure or prevent diseases. The higher score in medicinal value showed the community's high dependence on trees, wildlife, and nature. Interviewed people affirmed the findings. For example, one famous elderly person who lives in a remote Greater Mahale Ecosystem village that does not have a dispensary, when asked about communal medicinal forests and wildlife benefits, while pointing to the forest, said:

> *"That is our hospital", "Our forest is very important for us because we access medicinal plants and use them for cure, healing, and treatments." "Even though*

> *we are in a remote area, and we don't have health infrastructures, we access different medicinal plants in our forests for different diseases treatments such as typhoid".*

The realized medicinal benefit is in line with Tchakatumba *et al.* (2019) conclusion that when local communities benefit from natural resources, there are both increases in economic welfare and compliance with natural resource management.

Econometric Model analysis and hypothesis testing
Null hypothesis testing- H_1:
The study developed and tested a specific null hypothesis (H_1) through multiple linear regression techniques. The specific null hypothesis stated that H_1: Communal-indigenous consumptive terrestrial natural resources management approach does not significantly impact community economic benefit. Model fit test correlation, linear correlation, and multiple regression correlation were done to make a mathematical decision on the specific null hypothesis.

Model fit test correlation between communal-indigenous consumptive natural resources management approach (CCT) to community economic benefit (CEB) computed. The study R Square (R2) correlation model fit test showed an adjusted R Square of 0.54. The R Square of 0.54 is 54% explicated variation in community economic benefit explained by the inclusion of communal-indigenous consumptive utilization. The model has a good but not very strong R2 of 0.54, and therefore it has a moderate predictive ability (54%) as ranked by Almquist, Ashira & Brännström (2019) and Profillidis & Botzoris (2019).

Linear correlation relationship test between communal-indigenous consumptive natural resources management approach (CCT) to community economic benefit (CEB) computed. The Pearson (r) covariance statistical relationship correlation coefficient was calculated. The result was Pearson -r (733) = .73, $p<.001$. The positive Pearson (r) above 0.7 implied that the relationship was a strong correlation as per Almquist, Ashira & Brännström (2019) and Profillidis & Botzoris (2019) ranking and interpretation of Pearson (r).

Multiple linear regression analysis testing was performed for the impact of communal consumptive natural resources management (CCT) on

community economic benefit (CEB), and the results are presented in Table 2 below. In addition, communal-indigenous natural resources management consumptive utilization composites that were community hunting tourism (THC), farming near the conserved area (FMC), access to game meat and fruits for food (MFC), firewood collection (FWC), access to medicinal plants and wildlife (MDC) and logging and timbering (LGC) were analyzed and presented in Table 2 below.

Table 2: Multiple linear regression analysis for communal consumptive conservation approach on community economic benefit

Composites	**B**	**95% CI**	**β**	**t**	**p**	**SE**
Community tourism hunting	-2.194	-3.321, -1.066	-.143	-3.820	.000	.574
Farming near a conserved area	1.678	.952, 2.405	.198	4.535	.000	.370
Meat and Fruits for food	1.471	.925, 2.018	.147	5.289	.000	.278
Firewood collection	.778	.079, 1.477	.082	2.185	.029	.356
Medicinal benefit	1.524	.912, 2.356	.192	4.114	.000	.361
Logging and timbering	-.901	-1.538, -.265	-.090	-2.780	.006	.324
Communal consumptive	1.431	1.335, 1.527	.734	29.242	.000	.049

Note. CI = Confidence Interval for B, SE = Standard Error, p=0.000

The multiple linear regression analysis showed interesting findings that setting aside communal forests and hunting blocks will negatively impact community economic benefit, as shown in Table 2 above. The result showed that hunting tourism regression coefficient B= -2.19 at 95% confidence interval (CI) = -3.21, -1.066; p=0.000. The interpretation is that an increase of one unit of communal hunting tourism is associated with a decrease of 2.194 community economic benefit (CEB). Because p<5% and the confidence interval (CI) does not include a null value (x=0), it is statistically significant at the 5 % level. This finding speaks the same language as the above-quoted hesitating community interviews' perceptions of community economic benefit when land, forests, and wildlife areas are set aside for hunting tourism.

The findings presented in Table 2 also showed interesting value attached to medicinal plants and medicinal wildlife access in villages around the Greater Mahale Ecosystem. Access to medicinal impact on community economic benefit regression coefficient B= 1.52 at 95% confidence interval (CI) = .912, 2.356; p=0.000. The interpretation is that an increase of one unit of medicinal plant and wildlife access is associated with an increase of 1.52 community economic benefit (CEB). Because p<5% and

confidence interval (CI) does not include a null value (x=0), it is statistically significant at the 5 % level. The importance of access to medicinal plants and wildlife in communal forests was supported by community interviews as noted above under the medicinal plant and wildlife section.

The result of communal-indigenous natural resources management multiple linear regression analysis to community economic benefit is shown in Table 2. The result was regression coefficient B= 1.43 at 95% confidence interval (CI) = 1.34, 1.53; p=0.000. The interpretation is that an increase of one unit of the communal consumptive model is associated with an increase of 1.43 community economic benefits (CEB). Because p<5% and the confidence interval (CI) does not include a null value (x=0), it is statistically significant at the 5 % level. The findings above of multiple regression coefficient B= 1.43 at 95% confidence interval (CI) = 1.34, 1.53; p=0.000 was sufficient evidence against the null hypothesis (H_1) that stated communal-indigenous consumptive terrestrial natural resources management approach does not have a statistically significant impact on community economic benefit. Therefore, the null hypothesis (H_1) was rejected in favor of the alternative hypothesis. The result suggests that it could be true that the communal-indigenous consumptive terrestrial natural resources management approach may have a statistically significant impact on community economic benefit.

CONCLUSIONS

The general conclusion of this study is that community economic benefit (CEB) is most likely impacted by the communal consumptive terrestrial natural resource management approach. Moreover, regardless of Greater Mahale Ecosystem being remote with less developed infrastructures, communal consumptive utilization of natural resources grows the community's economic benefits (CEB).

RECOMMENDATIONS

The study recommends that improving the Western Tanzania tourist circuit is necessary to tap the low-hanging ripe fruit opportunity of the circuit. The relatively few hunting tourist activities in Greater Mahale Ecosystem (GME) should be developed. The development of tourist hunting blocks will improve consumptive utilization under communal-indigenous managed natural resources and under the government-state

managed approach. Furthermore, the Western Tanzania tourist circuit can link with Western Tanzania Ecosystem (WTE) conservation network.

The study also recommends integrating consumptive and non-consumptive approaches such as sustainable timber and avoiding deforestation and degradation of carbon credit to maximize community economic benefit.
Furthermore, this study recommends undertaking natural resources valuation in Greater Mahale Ecosystem (GME) and whenever possible in Tanzania. This will enhance Tanzania's knowledge of its natural capital, natural asset, and real wealth. Understanding how wealthy the Country is will enable realistic development plans. Natural resources are natural capital and a country's real wealth. Therefore, Total Economic Valuation (TEV) is recommended for Tanzania.

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English language Pedagogical Content Knowledge of English Language Beginner Teachers in Tanzania: A reflection to English language teaching method course in Tanzania Universities

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Abstract
This study explored English language Pedagogical Content Knowledge of secondary school English language beginner teachers in Tanzania on the aspects of self-perceived knowledge, understanding, and classroom teaching practices regarding English language PCK domains namely; English language teaching orientations, English language curriculum materials, English language learners' learning and English language instructional strategies. A total of 128 secondary school English language beginner teachers were involved from Dar es secondary schools. Simple random sampling and convenient sampling techniques were employed to obtain English language, beginner teachers. Data were collected by using a questionnaire method, semi-structured interview method, documentary review method, and observation method. The analysis of the data revealed that English language beginner teachers' conceptions regarding English language pedagogical content knowledge are partly. This is because despite English language beginner teachers self-perceive as highly knowledgeable and demonstrating good understanding regarding English language PCK, their actual classroom teaching practices are not appropriate. The study concludes that more opportunities should be given through English language teaching method courses during teacher preparation for student teachers to practice teaching activities in the respective PCK domains.

Keywords: *Pedagogical Content Knowledge, teaching method course, beginner teachers, PCK domains.*

INTRODUCTION

English language Pedagogical Content Knowledge is the knowledge base of teaching that blends the content of the English language with pedagogy (Faisal, 2015; Liu, 2013). According to Shulman (1987), Pedagogical Content Knowledge (PCK) is a body of knowledge that represents the blending of the content and pedagogy. It is with such blending, various domains of knowledge of teaching are composed together. Shulman (1987) for example describes PCK includes knowledge of specific content together with knowledge of instructional strategies and learners' learning in specific content. On the other way, Grossman (1990) considers PCK as a body of knowledge that includes knowledge of students' understanding, curricular materials, and instructional strategies. Again, Magnusson and Borko (1999) describe PCK constitutes knowledge of science curricula, knowledge of students' understanding of science, knowledge of instructional strategies, and knowledge of assessment of scientific literacy based on the orientation to teaching science. In general, a variety of but not fixed knowledge of teaching is composed together to form PCK.

English language Pedagogical Content Knowledge (PCK) is essential for teachers to enable effective learner learning. Literature indicates that by having PCK the teacher is in a position of facilitating learners' learning since he/she teaches beyond the subject content and teaches following the nature of learners (Kathirveloo, Puteha & Matematik, 2014; Shing, Mohd & Loke, 2015, Lucas, Villegas & Gonzalez, 2010). PCK is also acknowledged for enabling the teacher to select methods of teaching and learning that reflect the learning objectives, the content to be taught, the instructional objectives to be applied, the teaching and learning resources to be used, and learner characteristics (Lilian & Amollo, 2020). It is argued by Shing, Mohd, and Loke (2015) that by having PCK the teacher is capable of structuring the subject content and presenting it in a form that suits the diverse needs and abilities of students. Also, the teacher can prepare lessons with suitable strategies and elaborations that contribute to students' conceptual understanding.

Teaching method course is among the ways essential for developing teachers with PCK (Buarphan & Roadrangka, 2006; Dhonau, McAlpine, and Shrum, 2010; Kinach, 2002; Ball, 1990) during teacher preparation. The course develops teachers with PCK through the course content to intertwine the subject matter knowledge together with other domains of

knowledge of teaching such as the knowledge of children's learning and knowledge of curriculum (Ball, 1990; Kaya & Bayram, 2012). It is evident in various studies that through the teaching method course teachers develop an understanding of how curriculum materials can be used, develop an awareness of suitable modes of instructional strategies for students' learning as well as their roles in facilitating learning (Faikhamta et al., 2009; Buaraphan & Roadrangka, 2006). In addition, through the method course, teachers develop an understanding of students' conceptions, subject matter knowledge, and students' learning approaches (Ball, 1990).

In Tanzania, a university teacher education program includes an English language teaching method course for orienting secondary school English language prospective teachers with knowledge of how to teach the English language (University of Dar es Salaam, 2016; Open University of Tanzania, 2017). The English language teaching method course outline of the University of Dar es Salaam for example is aiming at to provide an analytic introduction to the entire area of language and language teaching, language syllabi in use in schools in terms of their objectives, content, teaching strategies, and materials as well as assessment modes (UDSM, n.d). Similarly, the English language teaching method course of the University of Dodoma is aiming at to enable the students to understand and reflect upon the role of language teachers and to provide student teachers with the knowledge and skills necessary in the current context of teaching and learning English (The University of Dodoma, n.d). This corresponds to the emphasis highlighted in the Education and Training Policy of 1995 which directs teacher education programs to impart to teacher trainees the principles and skills of pedagogy, creativity, and innovation (URT, 1995).

However, despite the intention of the English language teaching method course of developing prospective teachers with knowledge of how to teach the English language, the performance of the English language to secondary school students in Tanzania has persistently been worse (Makewa, Tuguta & Role, 2013) and teachers are claimed to be one of the reasons for such performance (Mtallo, 2019, Francis 2014, Mwakinyolobi, 2013 & Mosha, 2014). Therefore, following the position that teaching method courses hold of orienting prospective teachers with the knowledge of how to teach the specific subject matter during teacher

preparation, it was thought important to study the English language PCK of English language beginner teachers to explore English language beginner teachers' conceptions regarding the aspects related to English language PCK domains namely; English language teaching orientations, English language learners' learning, English language curriculum materials, and English language instructional strategies.

MATERIAL AND METHODS

A total of 128 English language beginner teachers were randomly sampled from a population of 160 English language beginner teachers by using sample size formulae provided by Cohen and his colleagues. From the sample size formulae by Cohen et al (2011) the researcher used a confidence level of 95% and a margin error of 5% to select English language beginner teachers concerning the population size of each university selected for the study. With that regard, 70 English language beginner teachers were graduates from University A, 29 English language beginner teachers were graduates from University B and 29 English language beginner teachers were graduates from University C. Quota sampling technique was also employed to select 23 English language beginner teachers to participate in classroom observation and interview sessions respectively to three universities were studied. More than one data collection method was used to collect multiple realities for supplementing since the researcher was able to cross-check the strength and consistency of information obtained from the field. The study also, considered informants consent and the willingness of participants to be involved in data collection. Respect for the anonymity and confidentiality of participants was ensured through the use of numbers and letters of the alphabet. After data collection thematic and content analysis techniques were employed.

RESULTS

Teachers' conceptions of English language teaching orientations

The findings through the questionnaire indicated that the majority of English language beginner teachers agreed that they are knowledgeable about English language teaching orientations. This is based on the reason that out of 112 English language beginner teachers, the majority 109 (97.3%) teachers agreed they know English language speaking skills, 108 (96.4%) teachers agreed they can help to solve English language problems learners encounter, and 107 (95.5%) teachers agreed they know

English language reading and writing skills. The findings imply that the majority of English language beginner teachers believed they are knowledgeable about English language teaching orientation-related aspects.

Moreover, the findings through interview sessions revealed that English language beginner teachers have a good understanding of English language teaching orientation. The findings indicated that by asking teachers for understanding regarding some English language teaching orientation aspects namely reading and speaking, English language beginner teachers conceived rightly the said aspects of English language teaching orientations. It was found that out of 23 teachers 11 (47.8%), teachers explained reading as a skill of understanding written messages, 8 (34.8%) teachers explained reading as a process of understanding written materials, and 4 (17.4%) teachers explained reading as the ability to read a text and understand what is written in it. In terms of reading being conceived as a skill of understanding written material teacher T12 graduated from University B explained:

> *When we say reading we mean a language skill which is about reading a text such as a book or a magazine just to mention a few to understand what is written there. During the activity of reading the reader is analyzing the content and interprets the meaning to understand the written materials of concern* (Teacher T12, School 7, October 2019).

In addition, teacher T1 graduated from University A explained that:

> *Reading is about understanding a reading material. To understand what is written in a text or reading material, a reader has to identify ideas and draw a conclusion. This is because the major focus of reading is to understand* (Teacher T1, School 3, October 2019).

For speaking, out of 23 teachers, 13 (56.5%) explained speaking as conveying a message through spoken language, 6 (26.0%) explained speaking as the process of using verbal and non-verbal symbols to communicate and 4 (17.4%) explained speaking as sharing information through speech. In terms of speaking being conceived as conveying a message teacher T17 graduated from University C explained:

> *First of all, speaking is a language skill that learners mostly learn in the early stages. It is a language skill in which a message or information is*

> *conveyed through speaking using parts of the mouth such as lips, teeth, tongue, and vocal tract* (Teacher T4, School 17, October 2019).

From the teachers' explanations above the findings indicated that English language beginner teachers understand appropriately the aspects related to English language teaching orientations.

Furthermore, through the interview, English language beginner teachers were asked to identify the language aspects associated with English language teaching orientations in the area of reading and speaking skills. The responses varied from one English language beginner teacher to another and from one language skill to another. Regarding reading skills, out of 23 teachers, 13 (56.5%) teachers identified alphabets, 10 (43.5%) teachers identified phonics, 10 (43.5) teachers identified fluency, and 8 (34.9%) teachers identified comprehension. For instance, in terms of the alphabet in the reading skill teacher T18 graduated from university C explained that:

> *In reading skills, there are many language aspects that any reader is required to observe when reading. Reading skill includes the alphabet. An alphabet is a written phoneme. Phonemes are sounds that we hear when we read loudly, when it is in writing it is called Alphabet. The alphabet can be a single letter such as b, m, n, a, o, and others, or can be a combination of letters* (Teacher T18, School 18, November 2019).

Concerning phonics in reading skills teacher T3 graduated from University A explained that:

> *In reading skills we find phonics. This is associated with letters in the spelling of words or letters in sounds that are produced by the reader during the reading* (Teacher T 3, September 2019).

On the side of speaking skills, out of 23 teachers, 21 (91.3%) indicated pronunciation, 19 (82.6%) indicated grammar and 16 (69.6%) indicated fluency. As regards pronunciation teacher T 13 graduated from University B explained that:

> *Speaking skill goes together with pronunciation which is about producing clearer language when speaking to facilitate communication. It should be understood that pronunciation is an aspect of speaking that helps to make the effective communication. In pronunciation, we find language aspects such as articulation, body language, gestures, phrasing, intonation, and rhythm* (Teacher T13, School 10, October 2019).

The findings above reveal that English language beginner teachers have an understanding concerning language aspects used to be found in particular English language aspects associated with English language teaching orientations.

Moreover, English language beginner teachers were asked to explain the way English language teaching orientation-related aspects namely: - reading and speaking skills are conducted. Regarding reading, out of 23 teachers 21(91.3%) explained that reading is done through scanning, 19 (82.6%) explained that reading is done through skimming and 16 (69.6%) explained that reading is done by reading closely the text. For instance, regarding skimming or scanning teacher T7 graduated from University A said:

> *There are various ways in which reading can be done. Reading can be done through scanning or skimming. By employing the skimming technique, for example, a reader has to read a text faster than the way normal reading is done. Specifically, skimming is done when a reader is in hurry or has many materials to read. The intention is just to take important information and main ideas* (Teacher T7, School 9, October 2019).

In addition, teacher T18 graduated from University C informed that:

> *A reader can use various ways to read. An individual can read a text through skimming, scanning, or intensively. In the scanning technique, the reader reads a text by quickly looking for important information throughout a passage such as a date. In scanning, the reader does not need to read the whole passage* (Teacher T18, School 18, November 2019).

From the teachers' explanations above the findings implies that English language beginner teachers understand how English language teaching orientation-related aspects are conducted.

Teachers' Conceptions of English language curriculum materials

The findings through the questionnaire indicated that the majority of English language beginner teachers agreed of being knowledgeable with English language curriculum materials. The findings revealed that out of 112 English language beginner teachers, the majority 109 (97.4%) agreed that they know the curriculum materials responsible for teaching English language skills. Similarly, the majority 108 (96.5%) teachers agree that they know the principles to consider in developing English language

curriculum teaching materials and the majority 106 (94.7%) teachers agreed that they know how to write instructional objectives in their teaching curriculum materials. The findings imply that English language beginner teachers self-perceived that they are knowledgeable about the English language-related curriculum materials.

Furthermore, through interview sessions, the study explored English language beginner teachers' understanding of English language curriculum materials. The study collected their understanding of the concept of curriculum materials and their understanding of the types of curriculum materials suitable for teaching and learning English language-specific skills namely: - reading, listening, writing, and speaking. In addition, the study collected their understanding of the factors that teachers have to consider in conducting curriculum-related activities. To start with understanding the concept of curriculum materials, the findings showed that teachers' conceptions of curriculum materials varied. Out of 23 English language beginner teachers, 14 (60.9%) teachers conceived curriculum materials as tools to guide what and how to teach or learn. On the other side, 9 (39.1%) teachers conceived curriculum materials as the total of materials teachers use to facilitate teaching. Being conceived as a tool to guide what and how to teach or learn, teacher T3 graduated from university A explained that: -

> *Curriculum materials are the guide that direct teachers on the topics to be taught or things to be considered during teaching. The curriculum materials mostly show the content to be taught and the competencies that the teacher is supposed to develop in English language learners in a specific topic. It is through curriculum materials such as syllabi, teachers obtain the main objectives and specific objectives* (Teacher T1, School 3, September 2019).

In terms of curriculum materials being conceived as a total of materials teachers use, teacher T16 graduated from university C explained that: -

> *I can say that curriculum materials are a total of all things that are intended to be used in teaching and learning. It is all about the things that a teacher is supposed to use in his/her teaching. It is from such materials that a teacher is directed on what he or she is supposed to consider in teaching students* (Teacher T16, School 18, November 2019).

Apart from that, English language beginner teachers were asked to identify the types of curriculum materials suitable for teaching and

learning English language-specific skills such as reading, listening, writing, and speaking. For writing skills, out of 23 teachers, 21 (91.3%) identified textbooks and 17 (73.9%) identified writing charts. For listening skills, out of 23 teachers, 20 (87%) identified radio cassettes and 9 (39.1%) teachers identified spoken texts and for speaking skills, 5 (21.7%) teachers identified a phone. In terms of textbooks as a curriculum material for writing and radio for listening skills, teacher T5 graduated from University A said that:

> *For teaching writing, the common material to be used is a textbook. For example, some of the books have stories and so when students read, they can learn writing. Sometimes, you can give a learner a textbook to read and summarise her/his words based on the key idea found in a textbook. Also, for listening, the more common material to be used is a radio cassette, I can give a radio to students to listen and identify the key points they have heard* (Teacher T5, School 15, October 2019).

The concept above was also the views of teacher 16 graduated from University C and teacher T10 graduated from University B. Teacher T16 stated that "for English language skills such as reading, a teacher needs to have books such as story books for students to read. For listening, a teacher is supposed to have audio materials such as radio for students to listen" (Teacher T16, School 18, November 2019). Also, teacher T10 graduated from University B explained that "if it is teaching of listening, a teacher is required to prepare spoken texts which will help a learner to listen and explain what was heard (Teacher T10, School 16, October 2019).

The above findings indicate that English language beginner teachers understand English language curriculum materials. They are aware of the concept of curriculum materials and types of curriculum materials for teaching a specific English language skill.

However, the findings from a review of English language beginner teachers' lesson plans indicated that there is some inconsistency between teachers' understanding and their actual classroom teaching practices. The findings indicated that the reviewed lesson plans of English language beginner teachers did not meet the required standards. It was found that out of 15 reviewed lesson plans, 9 (60%) lesson plans stated lesson objectives by not aligning the objectives outlined in the secondary school English language syllabus. In addition, 10 (66.7%) lesson plans stated

assessment activities by not addressing lesson objectives and 12 (80%) lesson plans stated assessment activities by not addressing lesson topics. For example, in terms of lesson objectives not to align the objectives into the syllabus, the lesson plan of teacher T22 from University C prepared for teaching sub-topic by *making telephone calls* to a main topic *asking for services*, the stated specific objective *"by the end of 80 minutes a student should be able to change active voice to passive voice",* did not align to the objective outlined into secondary school English language syllabus for the said topic which states *"the student to be able to make telephone calls using appropriate language"*. Again, the lesson plan of teacher T3 graduated from University A prepared for teaching a sub-topic *talking about shopping* a main topic *asking for services*, the specific objective did not align with the objective of the said topic in the secondary school English language syllabus which states "the student should be able to use appropriate expressions when shopping".

The findings above imply that there is an inconsistency between what English language beginner teachers self-perceived to have and understand regarding English language curriculum materials with their actual classroom teaching practices.

Teachers' conceptions of English language learners' learning

It was found through a questionnaire that the majority of English language beginner teachers self-perceived as being knowledgeable about English language learners' learning. The findings revealed that out of 112 English language beginner teachers the majority 109 (97.4%) teachers agreed to know how to collect students' prior understanding of English language concepts. Again, the majority of 106 (94.6%) teachers agreed they can adapt their teaching style to learners' learning differences, and 103 (92.0%) teachers agreed they know how to assist students with difficult English language concepts they encounter. The findings imply that English language beginner teachers self-perceived that they are knowledgeable about English language learners' learning.

Apart from that, through interview sessions English language beginner teachers' understanding was explored regarding English language learners' learning aspects. The study collected their understandings about principles to consider and teaching activities suitable for facilitating English language learners' learning. To start with principles to consider in

facilitating English language learners' learning, out of 23 teachers 19 (82.6%) teachers mentioned starting from simple to complex English language concepts, 16 (69.7%) teachers mentioned imitation, 15 (65.2%) teachers identified the use of English language into daily communication and 15 (65.2%) teachers identified to practice English language skills. Concerning with to start from simple to complex concepts, teacher T7 graduated from University A said that: -

> *You know, English like other languages depends of course on whether it is your first language or not. But if it is not your first language as your mother tongue, obvious you are supposed to start with small things before going to big things. These small things include issues like grammar, sentences such as how to comprehend sentences, tenses, etc. Although there is that you must learn first, maybe English writing and then speaking because how can you speak without noting down something* (Teacher T7, School 9, October 2019)

About imitation and practices, teacher T16 graduated from University C said that;

> *Students need to learn by imitating and by doing practices. There must be activities that a learner has to perform. For example, through debates, a learner will perform speaking on her/himself. There are also drills like writing, he/she will write stories, essays, and other things* (Teacher T6, School 18, October 2019).

In terms of teaching activities suitable for facilitating English language learners' learning. The findings showed that out of 23 interviewed teachers 18 (78.2%) mentioned the provision of English language learning materials to support learning, 17 (73.9%) mentioned the provision of activities for students to perform English language skills, 12 (52.7%) mentioned the use different English language teaching approaches during teaching and 9 (39.1%) teachers mentioned mixing of students with different learning capacities in a group. Teacher T4 graduated from University C said that: -

> *A teacher is supposed to have time at the beginning of the lesson before starting to teach to understand students' learning behaviors through activities. If you do it, you will be assisting learners to understand based on his/her capacity* (Teacher T4, School 17, October 2019).

Similarly, the English language beginner teacher; a graduate of University B said that;

> *Students are supposed to be given activities to practice the language skills taught. It should be learner-centered teaching and learning and not based much on teacher-centered teaching and learning. Instead of only explaining to students, you should also ask students to perform what you are teaching. This will make you understand if students understood what you are teaching* (Teacher T9, School 11, October 2019).

Though, the findings from classroom observation indicated that English language beginner teachers' actual classroom teaching practices regarding English language learners' learning varied from one aspect to another. The findings reveal that in some area's teachers' self-perceived knowledge and their understanding regarding English language learners' learning highly correspond to their classroom actual teaching practices and in some areas, they are less corresponding. In terms of highly corresponding to actual classroom teaching practices, the findings revealed that out of 69 classroom observation sessions, 67 (97.1%) sessions in English language beginner teachers introduced lesson topics to students and 52 (75.4%) sessions in English language beginner teachers collected students' prior understanding to concepts before they gave explanations. For instance, teacher T4 graduated from University A taught in Form Five a sub-topic *"identifying facts and opinions while listening"* from the main topic *"listening skills",* the teacher started the lesson by writing on the blackboard the main topic of the lesson "*listening skills*" and sub-topic "*Identifying facts and opinions while listening"*. Similarly, teacher T9 graduated from University B and taught in form three class started the lesson by writing on a blackboard the topic *"tenses".* Apart from that, in terms of collecting students' prior understanding of concepts before giving explanations teacher T11 graduated from University B taught the topic *"parts of speech"* and asked students what they knew about the concepts related to verbs. The teacher asked students to give the meaning of a verb and to give an example of words indicating position.

In terms of teachers' self-perceived knowledge and their understanding regarding English language learners' learning to correspond less their actual classroom teaching practices, the findings indicated that out of 69 sessions 20 (29.1%) sessions English language beginner teachers gave explanations to concepts that students found difficulty and 6 (8.7%) sessions English language beginner teachers introduced the objectives of the lesson to students. It was evident for example that when teacher T1 graduated from university A and taught the topic *"Word formation" and*

asked students to state the types of suffixation, the chosen students to respond spoke very down indicating not of being sure of the exact answer. Instead of finding the difficulty that students encounter the teacher continued with teaching. This was similarly evident when teacher T11 graduated from University B teaching a topic *"parts of speech".* The teacher not turned to give clarifications to the student and failed to give the difference between regular and irregular verbs rather than continuing with the lesson to teach about another issue.

The findings indicated that English language beginner teachers are partly conceiving the learning of English language learners. This is based on the reason that in some area's English language beginner teachers' actual classroom teaching was contrary to what they perceived to have and revealed to understand.

Teachers' Conceptions of English Language Instructional Strategies

The findings through the questionnaire indicated that the majority of English language beginner teachers self-perceived as being knowledgeable with English language instructional strategies. The findings revealed that out of 112 English language beginner teachers, 106 (94.6%) agreed they know how to engage students in the inquiry learning, 106 (94.6%) agreed they can use teaching approaches that support learners' creativity and 104 (92.8%) agreed they know how to make self-reflection when teaching. With these findings, it can be implied that English language beginner teachers self-perceived to be knowledgeable with the knowledge of English language instructional strategies.

The study explored further through interviews with the English language beginner teachers' understanding of English language instructional strategies. The focus was on their understanding of the concept of instructional strategies and principles to consider in the selection and conducting of instructional strategies for teaching the English language. To start with the concept of instructional strategies, the findings revealed that out of 23 teachers 16 (69.6%) teachers explained instructional strategies as teaching approaches to achieve the intention, 14 (60.9%) teachers explained instructional strategies as teaching techniques to simplify the process of teaching and learning and 9 (39.1%) teachers explained instructional strategies as a total of things teacher perform in a

class. As teaching techniques to simplify teaching teacher T3 graduated from University A explained that:

> *Instructional strategies are like methods or techniques which a teacher plans for simplifying the teaching of the English language. They are suitable to ease the teaching of the English language. They are the things included in the teachers' teaching plan. They are the techniques and methods to help the teacher meet what is planned to be met* (Teacher T3, School 10, October 2019).

The conception above was similar to the one held by teacher T13 graduated from University B, who said that;

> *Instructional strategies mean the techniques which teachers think will have to employ to deliver knowledge to students. It includes the techniques for using teaching and learning materials and the time showing when you will use lesson notes. It is also in a lesson plan you are supposed to show the methods you will use based on the subject requirements* (Teacher T13, School 13, October 2019).

Being the teaching approach Teacher T1 graduated from University A informed that: -

> *An instructional strategy is a teaching approach where we find teaching and learning materials, methods and techniques to be used for teachers to deliver the intended knowledge to students. Even if you are using a projector or audio, you need to think about the approaches to use the material to make students understand what is taught* (Teacher T1, School 3, September 2019).

Moreover, in collecting English language beginner teachers' understanding of the principles for the teacher to consider in the selection and conducting English language instructional strategies, the responses from English language beginner teachers varied. The findings revealed that out of 23 English language beginner teachers, 16 (69.7%) teachers mentioned considering the topic to be taught, 15 (65.2%) teachers mentioned considering the objectives to be met, 12 (52.1%) teachers mentioned considering who you are going to teach and 12 (52.1%) teachers mentioned to consider the context of which teaching is to be held. For instance, teacher T4 graduated from University A said that *"the teacher must consider a topic or language skill to teach"* (Teacher T4, School 17, October 2019). Similarly, teacher T9 graduated from University B had similar views; *that the teacher needs to consider the*

content that is going to be delivered (Teacher T9, School 11, October 2019). Also, teacher T18 graduated from University C provided similar views that; *English language teachers have to consider the topic that he/she is going to teach* (Teacher T18, School 18, November 2019).

The findings suggest that English language beginner teachers understand the concept of English language instructional strategies and principles for the teacher to consider in the selection and conducting of instructional strategies.

Nevertheless, through classroom observations, the study revealed that English language beginner teachers' actual classroom teaching practices regarding instructional strategies varied from one aspect to another. The findings informed that in some areas teachers' self-perceived knowledge and understanding regarding English language instructional strategies correspond highly to their actual teaching practices and in some areas, they are less corresponding.

In terms of corresponding highly to the actual classroom teaching the study found that out of 69 classroom observations all 69 (100%) sessions teachers used a variety of English language teaching methods and in 63 (91.3% sessions teachers used a variety of techniques that made students engage in the learning process. Regarding using a variety of English language teaching methods, the teachers were found to use grammar-translation methods, task-based methods, and communicative language teaching methods. For example, teacher T11 graduated from University B teaching the topic *"Parts of speech"* wrote sentences on the blackboard, and demonstrated to students the grammatical rules of using a preposition or verb in a phrase. Similarly, teacher T9, who graduated from University B teaching the topic *"present tense"* employed the grammar-translation method and task-based method. The teacher demonstrated to students the grammatical rules for the sentence to be either simple present tense or simple present continuous tense. Regarding the use of techniques that engage students in the learning process, the majority of teachers were observed probing students' understanding before giving the explanations concerned. For instance, teacher T4, who graduated from university A teaching the topic *"identifying facts and opinions while listening"* probed students' understanding by asking questions and seeking further clarifications from students' answers. Similarly, teacher T17 graduated from University C teaching the topic *"written literature"* and

brainstormed students' understanding by asking students to explain a certain concept before he gave further explanations.

In terms of teachers' self-perceived knowledge and understanding to correspond less the actual classroom teaching the study found that out of 69 observation sessions 12 (8.7%) sessions teachers did self-reflection of the lesson during teaching and 13 (18.8%) teachers facilitated students' learning during group discussions. Regarding self-reflection, the majority of English language beginner teachers ended lessons without asking students' views regarding the lesson. For instance, together with a variety of teaching activities teacher T15 graduated from University C performed such as introducing the lesson topic and objectives to students, probing students' understanding, and providing group activities, the teacher ended the lesson without asking students about the lesson. Similarly, teacher T20 graduated from University B started the lesson by reminding students about the previous lesson which was followed by explaining and discussing various issues relating to the topic. The teacher marked students' activity that was provided to students, summarised, and closed the lesson.

DISCUSSION

The study explored English language beginner teachers' conceptions of English language PCK. The study explored teachers' self-perceived knowledge, understanding, and classroom actual teaching practices regarding English language PCK domains namely: - English language teaching orientations, English language curriculum materials, English language learners' learning, and English language instructional strategies. The findings indicated that teachers' self-perception of English language PCK is high since English language beginner teachers self-perceived to be knowledgeable with English language orientation, curriculum materials, learners' learning, and instructional strategies. This is similar to the study by Dewi et al (2020) who found that English language teachers have a strong perception of pedagogical content knowledge since teachers were found to have a strong perception of the knowledge of the subject matter, the knowledge of young learners' learning characteristics and the use of learning strategies. The study is also aligning Eslami and Fatahi (2008) who studied teachers' English language proficiency in Iran and found that teachers are proficient in the English language because they perceived themselves as proficient in reading and speaking. The study

indicated further that English language beginner teachers had a good understanding of English language PCK. This is based on the reason that teachers explained correctly the concepts related to the English language PCK domains. The findings are contrary to the study conducted by Lyu (2021) which indicated that some teachers did not understand task-based learning despite that they used it in their college. However, the study revealed that there is an inconsistency between English language beginner teachers' self-perception and understanding of their classroom teaching practices regarding English language PCK. The findings seemed to concur with the study of Dewi et al (2020) who found a discrepancy between teachers' perceptions and implementation by teachers' perceptions, not correlating implementation. Moreover, the study concurs with Lyu (2021) who revealed that some teachers

CONCLUSION

By reflecting on the findings revealed from English language beginner teachers' conceptions regarding English language PCK, the current study indicates that English language beginner teachers' conceptions regarding English language PCK are partly. Despite the English language, beginner teachers' highly self-perceived knowledge and demonstrate a good understanding of English language PCK, their actual classroom teaching practices are not appropriate. Basing on the findings and conclusion the current study is thus significant to a teacher education program to make sure that during teacher preparation the English language teaching method course is organized by giving student teachers enough time to exercise actual classroom teaching either in schools or in improvised classes in the university campus to make teachers bridge the gap between the theoretical understanding they have with the actual practices. Furthermore, more and similar studies should be conducted concerning teachers' PCK in other academic subjects.

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A Review and Future Directions of Brand Experience Research in Tourism

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Abstract
This paper presents a review of brand experience studies in tourism using a systematic literature review while utilizing a total of 44 articles that were published in 30 journals. Four databases were used to search for the articles including Taylor and Francis, Google Scholar, Emerald, and Science Direct. The objectives of this review were to discuss the extant state of brand experience literature in the tourism industry, summarize the antecedents, mediators, moderators, and outcomes of brand experience and identify the gaps in the current studies and suggest the areas of future research. The results indicate that the quantitative research approach, convenience sampling technique, cross-sectional survey strategy, and structural equation modeling have dominated brand experience research. Various theories used, contexts, methodologies, antecedents, mediators, moderators, and outcomes of brand experience are also discussed in the paper. It is concluded that brand experience influences the majority of customer-related and brand-related constructs. Thus, it is recommended that tourist agencies, destination practitioners, and other tourism stakeholders should invest in generating pleasurable experiences at every touch point of their service to differentiate themselves from their competitors.

Keywords: *Brand experience, tourism, content analysis, systematic literature review*

INTRODUCTION

Brand experience construct is conceptualized as "sensations, feelings, cognitions, and behavioral responses evoked by brand-related stimuli that are part of a brand's design and identity, packaging, communications, and environments" (Brakus et al., 2009). The authors also developed a four-dimension scale namely sensory, affective, behavioural, and intellectual dimension. However, Nysveen, et al. (2013) added the relational

experience dimension as the fifth dimension of brand experience as it is important, especially in services. To further develop and enable the brand experience framework to suit different contexts and industries, previous scholars introduced other constructs like retail brand experience (Rodrigues & Brandão, 2021), destination brand experience (Kumar & Kaushik, 2018), hotel brand experience (Khan & Rahman, 2017) and online brand experience (Morgan-Thomas & Veloutsou, 2013).

Since its inception, the field of brand experience has witnessed dramatic development and has attracted the attention of scholars and practitioners (Khan & Rahman, 2015). Consequently, branding literature has stressed the need to build better and unique consumer experiences to create stronger brands. More emphasis on this school of thought has been given by brand management scholars and practitioners who believe that experiences emanating from contacts with brands have a significant influence on consumer behavior (Brakuset al., 2009; Pine & Gillmore, 1998; Schmitt, 1999). Gilmore and Pine (1998) underscored that business firms should concentrate on selling experiences generated from brands rather than products or services per se. This is because consumers are no longer concerned with simply purchasing products and services; they look to satisfy their emotional needs through pleasurable experiences from buying goods and services (Pine & Gilmore, 1998; Schmitt, 1999). More precisely, consumers are after products, marketing communications, and campaigns that dazzle their senses and touch their minds (Schmitt, 1999). This is particularly true for service brands (like tourism), where experience is considered as important as the service itself (Gilmore, 2003; Morrison & Crane, 2007).

Brand experiences have been described as an important driver in tourism brand building due to their link with nurturing the psychological well-being and personal development of tourists (García et al., 2018). According to Wang et al. (2020), "the importance of implementing marketing strategies based on the experiential economy is no exception in tourism and leisure in that experience is a major factor in differentiating tourism and leisure services to form positive images and memories from their visit". Rather (2018) also pointed out that generating excellent customer experiences in the contemporary hospitality industry is the core source of differentiation strategy which accounts for competitive advantage as it creates valuable customer relationships. Even though

brand experience can be used to differentiate oneself from competitors in the tourism sector, there are still limited studies of brand experience. Andreini et al. (2019) pointed out that "to date, there is still only one definition, a single operationalization of the brand experience construct, and a single theoretical perspective through which it is approached". The direction in which brand experience research is now headed is also unclear (Khan& Rahman, 2015). Moreover, the branding factor in consumer experience has not been earnestly studied on its own merits (Zha et al., 2020).

Generally, the area of brand experience is still growing, this calls for a review to ensure that brand experience studies will move in the right direction. Reviews of previous studies offer a roadmap for future study undertakings (Zha et al., 2020). There is therefore a need to have frequent and honest reassessments to have a clear idea of one's position in the domain (Cooper, 2010). The review of brand experience literature by Khan and Rahman (2015) found that a comprehensive study giving a deeper understanding of the brand experience concept is missing. A review of brand experience studies by Andreini et al. (2019) discovered with considerable concern that, since the first conceptual models suggested by Schmitt (1999) and Brakus et al. (2009), no studies had made a critical assessment or theoretical evaluation of the essence of the brand experience construct. There was therefore a need to conduct this review to fill this gap. The current review differs from that of Khan and Rahman (2015) and Andreini et al. (2021) in at least two regards: (1) they were general and did not focus only on studies done in the tourism industry like this study (2) their reviews did not use the Theory-Context-Characteristics-Methodology review protocol which was applied by the current study.

Hence, the overall objective of this paper was to build upon previous empirical studies on brand experience and offer guidelines for future research. Specifically, the current paper aimed at (1) discussing the extant state of brand experience literature in the tourism industry, (2) Summarize the antecedents, mediators, moderators, and outcomes of brand experience in the field of tourism (3) To identify the gaps in the current studies and suggest the areas of future research in tourism. To attain these objectives, the paper addresses the following questions:

(a) What is the current state of brand experience literature in terms of theory utilized, journal distribution, country of research, and methodologies?
(b) What are the antecedents, mediators, moderators, and outcomes of brand experience in the tourism industry?
(c) What are the important areas of research that should be addressed by future researchers in the field of brand experience?

The next section of the paper is structured as follows: First, the paper presents the methodology applied, followed by the findings, conclusions, and recommendations, and lastly presents the agenda for future research.

RESEARCH METHODOLOGY

This review applied the theoretical, Context, Characteristics, and Methodology (TCCM) framework (Shimul, 2022) to offer a holistic analysis of the theoretical perspectives (T), contexts (C), characteristics (C), and methodology (M) of brand experience literature. This method also has been extensively used in recent reviews (Chen et al. 2021, Mandler et al., 2021; Hassan et al., 2022; Paul & Rosado-Serrano, 2019).

The data used were obtained from different four online databases namely Science Direct, Taylor and Francis, Emerald, and google scholar as previous studies (Vlahovic-Mlakar, 2022). Science Direct is amongst the most cherished and comprehensive online databases for tourism research journals because of its high degree of search functionality and coverage over the stated timeframe (Chen et al., 2021). Google Scholar was used as it returns the most comprehensive results over other databases (Chen et al., 2021). Taylor & Francis is considered one of the reputable publishers that publishes comprehensive articles (Levinson & Amar, 1999) whereas the Emerald database was used to increase the variability of published brand experience articles in the current review. Content analysis was utilized in this study to classify the reviewed articles. According to Holsti (1969), content analysis is a "technique for making inferences by objectively and systematically identifying specified characteristics of messages".

This study used a three-stage approach by Denyer and Tranfield (2009) and Moher et al. (2009) for mapping and selecting articles for final review. The first stage included data mapping in which selected keywords

were used to search articles. The keywords used included "Brand experience", “Brand experience” and “tourism", "Destination brand experience", “Destination brand experience” and “tourism", “Online brand experience", “Online brand experience” and “tourism” and "Customer experience”, “Customer experience” and "tourism". These keywords were searched across article titles, abstracts, and keywords to search for the most relevant studies. The articles in English and published from 2009 to 2022 were included. The second stage was refining the search findings where the initial search from the database resulted in 680 articles. Among the articles, 330 were either duplicates, not in English, proceedings, book chapters, or books and hence were excluded from the review. Screening of the articles resulted in the exclusion of 204 articles because full articles were not available, and brand experience or tourism was not the main topic of the article. For eligibility, 102 articles were excluded because they were not relevant to the topic i.e. they did not include both brand experience and tourism as the main topic of study. The third stage included the assessment of the articles and finalizing the review list. Using the inclusion and exclusion criteria, a total of 44 articles remained for review. The author read the articles across the title, abstract, keywords, background information, theoretical approach, contexts, characteristics, results, and contributions of the articles. MS Excel worksheet was used for coding the captured information from the reviewed articles.

RESULTS AND DISCUSSION

Current state of brand experience research in the tourism industry literature

A total of 44 articles included in this study were published in thirty (30) journals. Figure 1 indicates that the majority of articles were published in the journal of Sustainability (5), International Journal of Contemporary Hospitality Management (4) and Journal of Travel and Tourism Marketing (4). The Journal of Hospitality Marketing and Management received three (3) articles while Current Issues in Tourism and Journal of Destination Marketing and Management each recorded two articles. Each of the 24 remaining journals received one article as presented in Figure 1. These findings imply that brand experience scholars prefer to publish their papers in the Journal of Sustainability, International Journal of Contemporary Hospitality Management and Journal of Travel and Tourism Marketing. This may be because these journals publish quality

and original works and are hence regarded as good media for sharing and disseminating research results.

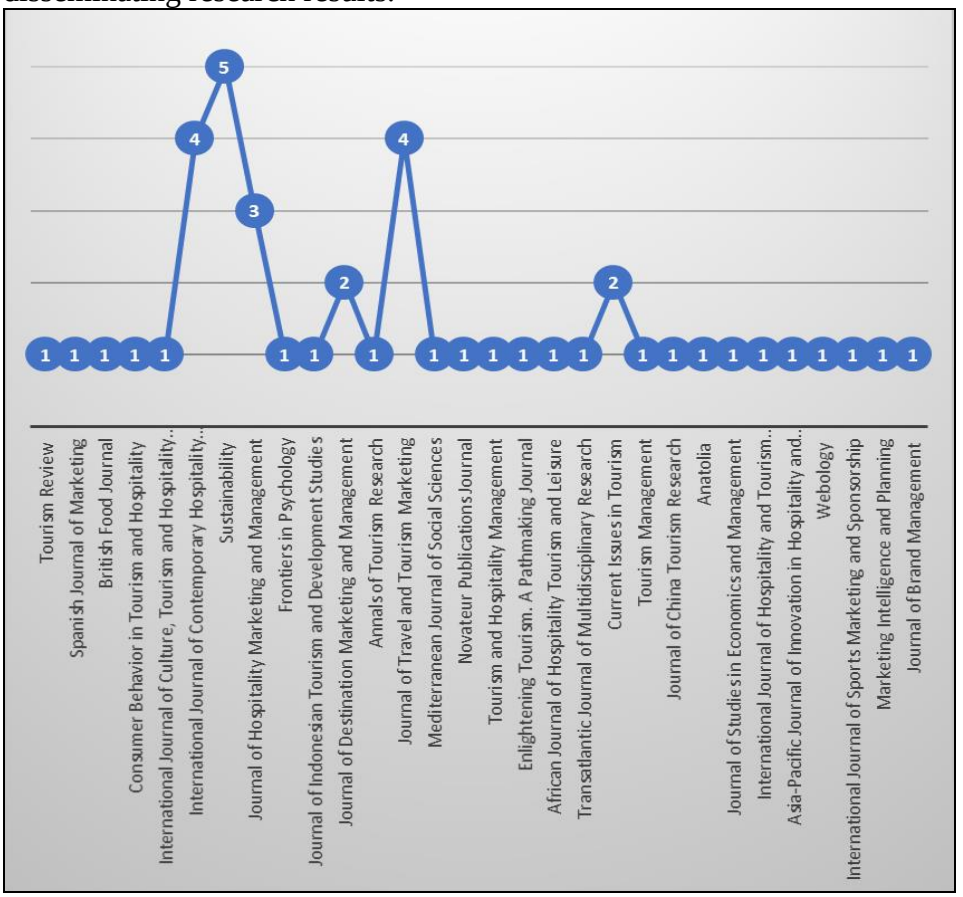

Figure 1: Distribution of published articles by journal

3.2 Distribution of brand experience research by country

This study identified the distribution of brand experience studies in the tourism industry across the globe. The distribution of brand experience research by country is shown in Figure 2. It reveals that the majority of brand experience studies in the tourism industry have been done in the China (10) followed by USA (6), India (5) and Indonesia (3). These findings imply that China is actively involved in studies about brand experience especially tourists' experiences. This connote also that the China is the major contributor of brand experience studies specifically in the tourism industry followed by USA, India and Indonesia. This may be attributed to the high economic growth of the country which raises the

rate of spending to individuals through tourism. The findings also indicate that each of the three countries namely Nigeria, South Korea, and Spain had two studies (2) while the remaining fourteen (14) countries had only one study implying that these countries are minor contributors to brand experience studies.

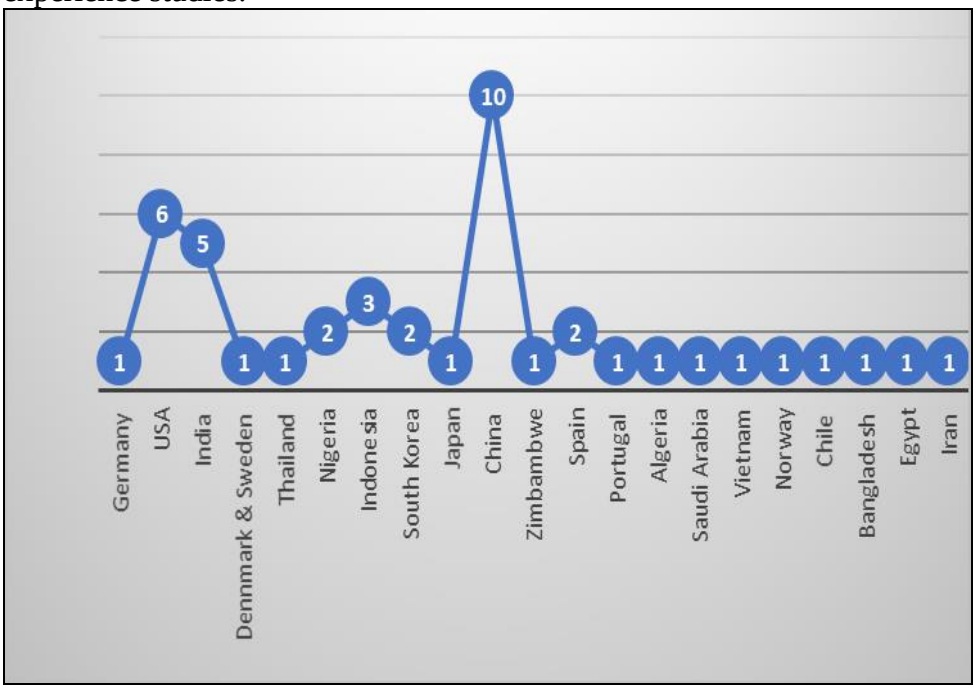

Figure 2: Distribution of brand experience research in tourism industry by country

Distribution of brand experience research by year of publication

There has been an increase in studies about experiences encountered by consumers from brands. The current review indicates that there was only one article that was published in 2014 regarding experiences encountered by tourists. However, there was a gradual increase in the number of articles published in the year 2017 and 2019 where five and six articles were published respectively (Figure 3). The following year (2020) experienced a twice increase of articles published equating to 12 articles that were published regarding this area. However, after this year, there were gradual decrease of number of papers published where 10, 3, and 4 papers were published in 2021, 2022 and 2023 respectively. These findings suggest that experiences encountered by tourists are gaining more attention from researchers. Similarly, the literature reveal that, it has

become important to be conscious of the manner destination brands are experienced by tourists (Berrozpe et al., 2019; Kumar & Kaushik, 2017; Rather et al., 2020).

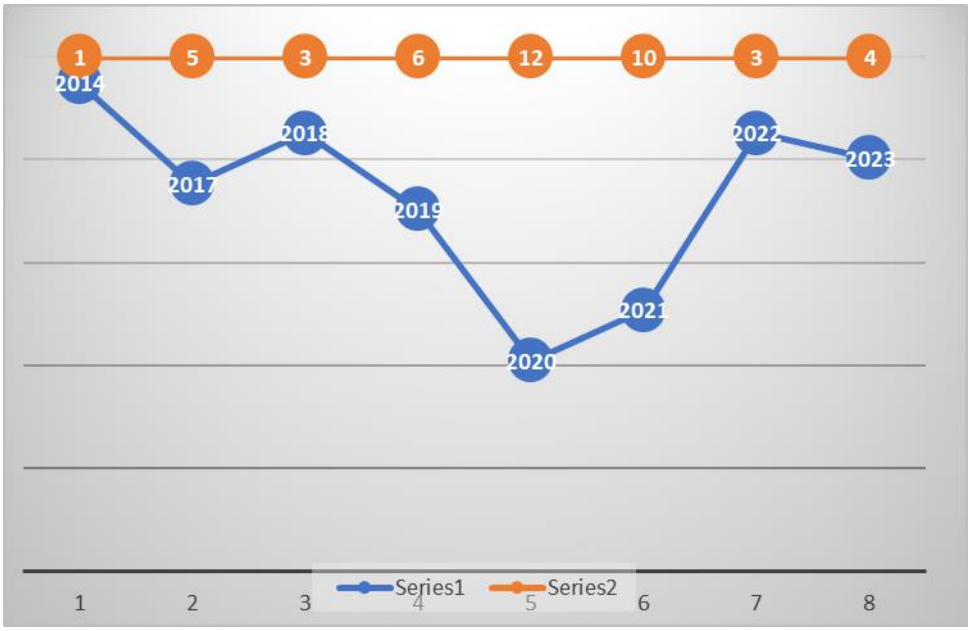

Figure 3: Annual scientific publications from 2014 – 2023

Theories used by brand experience studies in the tourism industry

The theory is defined as a set of assertions that are scientifically connected and that can be tested empirically (Hunt, 2002). Stam (2007) regards theory as the systematic organization of knowledge that can be utilized for solving problems. The theory is used to conceptualize and elucidate a set of systematic explanations of phenomena and complex behaviors (Thomas, 2017). Hence it was important to identify the theories used by different scholars in an attempt to understand the behaviour of tourists as they become exposed to various destination experiences. Figure 4 indicates various theories which were used by scholars in the reviewed articles. It reveals that social identity is among the theories used by various authors in an attempt to understand the behavior of tourists from destination brands. Social identity theory postulates that individuals group themselves into numerous social classes to help their definition of their own-self (Tajfel & Turner, 1985). Individuals' identification with a brand community and the positive experiences derived from belonging to

a particular brand community can affect their relations with the brand, the product, the firm, and other individuals.

The theory of social identity has been used by Kumar and Kaushik (2017) to determine the role of destination brand experience in assessing the holistic and unified view of tourism destinations. In their study, the authors found that different dimensions of destination brand experience have a diverse influence on destination brand identification that consequently affects both tourists' trust and loyalty toward tourism destinations. Rather et al. (2020) also used the social identity theory amongst other theories (Self-congruity theory, and attachment theory) to develop and test a theoretical model of destination branding that assimilates the concepts of destination brand experience, identification, value congruence, attachment, and tourist's behavioral intentions. It was found that brand experience, value congruence, and destination credibility cause divergent effects on destination brand identification, which subsequently affects tourists' destination attachment, advocacy, and brand loyalty toward tourism destinations.

The Stimulus-Organism-Response (S-O-R) framework was also applied to study the experiences of tourists toward destination brands in the reviewed articles. This framework was first introduced in environmental psychology by Mehrabian and Russel in 1974 and later became popular in the field of marketing. The S-O-R framework elucidates how the stimulus (S) as a precursor influences individuals' internal organisms (O) and behavioral responses (R) (Mehrabian & Russell, 1974). The S–O–R framework comprises three dimensions namely stimulus, organism, and response (Mody et al., 2017). Stimulus encompasses marketing mix and external environmental inputs which influences an individual's internal state. The organism is a superseding process between stimulus and response which comprises perceptual, physiological, feeling, and thinking activities. On the other hand, Response refers to an approach or avoidance behaviour for the ultimate decision of consumers. Using the S-O-R framework, Phan & Ting-Yueh (2022) proposed a mediation model to augment existent knowledge by emphasizing the effect of brand innovativeness towards brand loyalty through individual dimensions of online brand experience in the online booking setting. The findings of their study reveal that sensory, affective, and behavioral experiences are the leading factors in building loyalty to brands respectively. The authors

also report that online brand experience fully mediates the relationship between brand innovativeness and brand loyalty. Haobin et al. (2021) also utilized the S-O-R framework to develop and test a conceptual model that assessed the effect of servicescape on brand experience through mindfulness. It was found that hotel servicescape exerts influence on brand experience through customers' mindfulness. Kwon and Boger (2020) also applied the S-O-R framework amongst other frameworks (customer inspiration) to determine the potential predictors of customers' pro-environmental intention using green hotel customers. Their study found that brand experience and customer inspiration have a significant effect on pro-environmental intention. It was also found that customer inspiration plays a significant mediating role between green hotel brand experience and pro-environmental intention.

The reviewed articles reveal that the Theory of Reasoned Action (TRA) and Theory of Planned Behavior (TPB) have been also applied in studying brand experience in tourism. The TRA postulates that the behavior of individuals (in this case tourists) can be predicted from behavioral intentions, attitudes, and subjective social norm influences (Becker & Gibson, 1998). The immediate antecedent to predicting behavior is the behavioral intention whereas the attitudes and subjective social norms exert influence on behavioral intention creation. The TPB is the extension of TRA. It integrates a third precursor of intentions namely perceived behavioral control and therefore, behavioral intention becomes a function of three direct predictors including attitudes, subjective norms, and perceived behavioral control (Conner & Armitage, 1998). The TRA and TPB assume that individuals form behavioral decisions while considering the existing information. Thus, behavioral intentions enable scholars to study the actual behavior of tourists who have experienced destination brands. Using TRA and TPB, Singh & Mejraj (2019) examined the effect of destination brand experience on the behavioral intention of tourists. The authors reveal that brand experience has a positive influence on tourists' satisfaction and that tourists' satisfaction positively influences their revisit intention. It was also found that brand experience exerts a positive influence on tourists' intention to revisit.

The theory of Embodied cognition was also used in the reviewed articles. This theory is based on the assumption that the body functions like a component of the mind rather than a passive perceiver and actor serving

the mind. The embodied cognition theory indicates a strong association between psychological states and physical experiences (Krishna, 2012). This theory regards the experience of tourists as a complex process in which external sensory stimuli are transformed into internal perceptions (Agapito et al., 2013), signifying that bodily sensations could lead to emotive responses (Lv et al., 2020). Another theory was the bottom-up spillover theory; this theory posits that people's overall happiness is established by various domains, like family, work, health, leisure, and travel (Erdogan et al., 2012). Using both the embodied cognition theory and bottom-up spillover theory, Lv and Wu (2021) examined the influence of extraordinary positive sensory experiences on building destination brand love. The results reveal that creating extraordinary positive sensory experiences has a positive impact on establishing destination brand love.

On the other hand, sensory impression theory was applied in one article. This theory stresses that individuals perceive the world via the senses, and the long-standing memories of physical experiences have a direct effect on an individual's attitudes and behaviors (Agapito et al., 2014). The theory of sensory impression was utilized by Elvekrok & Gulbrandsøy (2021) to determine the relationship between the degree of sensory inspiration and positive memory in staged experiences. The results indicate that there was a strong association between the sensory dimension and positive memory and that cognitive and affective dimensions partially mediate the relationship. Other theories applied by the reviewed literature include trust formation theory and social exchange theory (Torres-Moraga & Barra, 2023), self-expansion (Guo & Hsu, 2023), flow theory (Fu et al., 2020) and interactionist-based theory (Shang et al., 2020).

Together with various theories used by scholars, the majority of the articles (24) used Brakus et al. (2009) conceptualization. However, the authors of these articles relied on the theoretical viewpoint of brand experience resulting from the work of Brakus et al. (2009) without offering any criticism or additional theoretical explanation of the concept (Andreini et al., 2019). Scholars have failed to further develop the definition and operationalization of the brand experience construct. This is a gap that needs to be filled by future research.

To sum, the finding revealed that four (4) articles used the theory of social identity and four (4) used the Stimulus-Organism-Response framework. This suggests that the two theories are mostly used by authors when they want to study brand experience particularly in tourism. Other studies used more than one theory including that of Singh and Mejraj (2019) which applied the TRA and TPB, Rather et al. (2020) which utilized the Self-congruity theory, Social Identity Theory, Attachment theory as well as that of Phan and Ting-Yueh (2022) that applied the S-O-R framework and Signaling theory. This may be due to the fact that these theories are suited to explain the experiences encountered by tourists from different destinations. On the one hand, the majority of the studies (54.5%) used the Brakus et al. (2009) conceptualization and measurement scale. These findings suggest that the conceptualization of brand experience by Brakus et al. (2009) is still considered the best approach when somebody wants to study the experiences of tourists towards various destination brands. However, it is still questionable whether this conceptualization can suit every type of tourism such as cultural tourism, eco-tourism, beach tourism, medical tourism, adventure tourism, gastronomic tourism, and wildlife tourism to mention a few. There is a need therefore to test it for various types of tourism. Future research is also needed to further develop the definition and operationalization of brand experience construct.

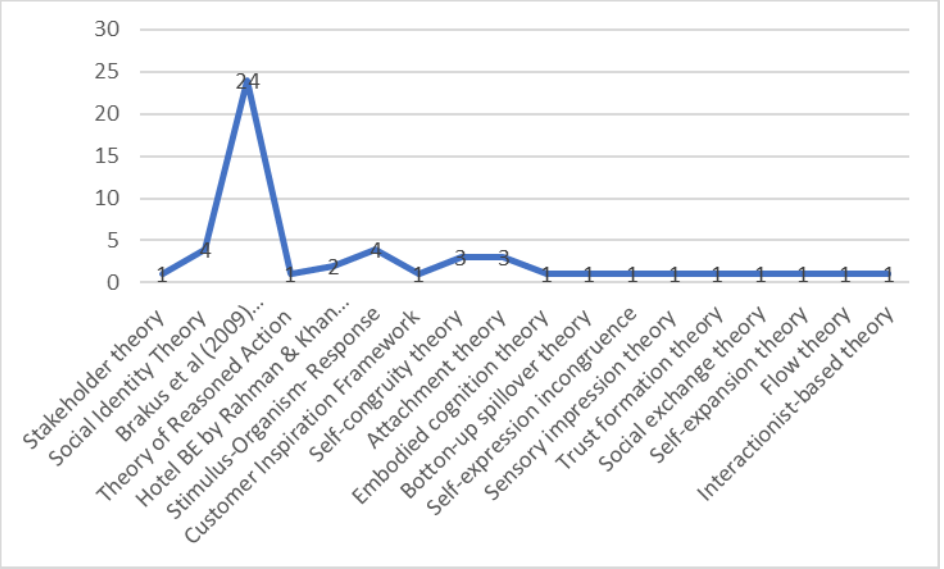

Figure 4: Theories used by reviewed articles

Context perspective

Contexts refer to the subsection of physical and conceptual positions of interest to a certain entity (Pascoe 1998). The TCCM method considers contexts as the environments which form the research setting (Paul & Rosado-Serrano, 2019). This study grouped the contexts of the reviewed articles into four main groups namely Offline context, general online context, Amazon Mechanical Turk, and Sojump. The offline context referred to studies that collected data face-to-face while the general online context referred to studies that gathered data through normal online means such as emails, websites, etc. On the other hand, Sojump, referred to studies that collected data through Sojump which is a professional online survey platform (Lv & Wu, 2021). The Amazon Mechanical Turk context referred to studies that collected data via the Amazon Mechanical Turk which is the crowdsourcing website that permits employees to do jobs for monetary rewards (Yang &Wang, 2015). It was discovered that the majority of reviewed articles (32) used offline context, followed by those that used general online context (11), Amazon Mechanical Turk (2), and Sojump (1). The total number reported contexts is more than 44 because two of the studies used both offline and online. These findings imply that the majority of scholars are in favor of face-to-face interactions while gathering information regarding experiences encountered by tourists. In other words, face-to-face interactions are the major source of information for brand experience studies, particularly in Tourism.

Characteristics perspectives

The next sections synthesize the constructs and their relations to brand experience. Specifically, it presents the antecedents, consequences, mediators, and moderators of brand experience in the tourism industry.

Antecedents of brand experience

Scholars have determined the antecedents of brand experience in the tourism industry. Using the Self-expression incongruence theory. Tarigan et al. (2021) discovered that tourist self-expression, destination attraction, and destination image are determinants of brand experience. Haobin et al. (2021) also concluded that mindfulness is a predictor of brand experience. In other words, if an individual is aware of what is happening in the surroundings, that awareness has a positive influence on the experiences encountered by tourists. Ahn and Back (2018) on the other hand, posit

that brand reputation is also among the determinants of brand experience particularly in the field of tourism.

The quality of the brand has been also reported to exert an influence on experiences encountered by tourists towards various destination brands (Seehanam et al., 2018). Other scholars such as Kim et al. (2022), also examined the influence of destination brand and brand awareness on destination brand experience and found that both the destination brand and brand awareness are the predictors of destination branding. A study by Guo and Hsu (2023) in China utilized the self-congruity theory among others to determine the relationship between brand experience, self-congruity, brand attachment, self-expansion and brand identification and found that self-congruity is an antecedent of brand experience. Interestingly, Rezaei et al. (2017) in Iran, studied the influence of customer perceived relationship marketing, quality of service and brand experience on tourists' satisfaction and actual expenditure behavior. Their results, revealed that brand experience is influenced by customer perceived relationship marketing. Moreover, Chiang and Chen (2023) in China examined the link between tourism destination brand identity, brand experience and intention to recommend. The findings of this study shows that destination brand identity is an antecedent of brand experience. In other words, tourism destination brand identity is important in creating overall brand experience of tourists. Generally, these findings indicate that brand experience is influenced by other brand-related and customer-related factors. This further connote that there is a need for tourism actors to identify and invest in factors that build positive experiences for successful industry. Moreover, although these studies have unveiled several antecedents of brand experience, still the list is not exhaustive and hence there is an avenue for testing more customer and brand-related constructs to broaden the understanding of the antecedents of this construct including green image, tourist attitude, self-image congruity, and marketing communications.

Mediators of brand experience in the tourism industry

This review also identified the mediators of brand experience in the tourism industry. It was found that the majority of reviewed articles discovered that satisfaction plays a big role in mediating the relationship between brand experience and other constructs (Barnes, et al., 2014; Chukwunwem & Ndubueze, 2018; Hussein, 2017; Wang et al., 2020;

Odor & Okeke, 2020; Martins et al., 2021). Destination brand identification also has been found to mediate the relationships between brand experience and other constructs such as brand loyalty and destination trust (Han et al., 2019; Kumara & Kaushik, 2017). Destination brand identification can play either a partial mediator role or a full mediator role (Kumara & Kaushik (2017). Meaningful and involvement are also mediators of brand experience in the tourism industry (Legendre et al., 2019). A study by Elvekrok and Gulbrandsøy (2021) reveals that affective and cognition dimensions mediate the relationship between sensory and memory dimensions in staged experiences.

On the one hand, momentary happiness and retrospective happiness are the mediators of brand experience. This was observed by Lv and Wu (2021) in their study about the influence of extraordinary positive sensory experiences on destination brand love. Jimenez-Barreto et al. (2020) also discovered that perceived online destination brand credibility mediates the link between online destination brand experience and behavioral intention towards the destination. Customer inspiration has been also found to mediate the relationship between brand experience and pro-environmental intention (Kwon & Boger, 2020).

The reviewed literature further indicates that memory mediates the relationship between brand experience (in particular the intellectual dimension) and the behavioral intentions to revisit the theme park (Wang et al., 2020). Brand trust (Narimane & Lahcen, 2021), destination brand authenticity (Khan & Fatma, 2021), involvement and meaningfulness (Legendre et al., 2019), and customer mindfulness (Haobin et al., 2021) are also mediators of brand experience. Other identified mediators include heritage destination loyalty (Rahman et al., 2021), self-expansion (Guo & Hsu, 2023), flow experience and self-congruity (Fu et al., 2020), place attachment (Shang et al., 2020), brand attachment (Kang et al., 2017), brand relationship quality (Tang et al., 2023) and trustworthiness (Torres-Moraga & Barra (2023). The presence of various mediators of brand experience connote that brand experience influences brand-related and customer-related variables either directly or through other variables. This calls for other studies to research on more mediator variables such as consumer's emotions like joy and anxiety, social accomplishments, brand competence, and brand aspirations.

Moderators of brand experience in the tourism industry

This systematic review discovered that only a few of the articles (6) considered moderator variables and the remaining (38) did not include moderator variables. Ahn and Back (2019), examined the influence of cruise brand experience on perceived functional and wellness values and found that cruise brand experience influences perceived values. It was also revealed that service expertise played a big role in moderating the relationship between cruise experience and perceived values.

Chan & Tung (2019) also determined the influence of robotic service on guest appraisals of hotel brand experience and determined the moderating effects of hotel segment on guest appraisals of brand experiences. The findings reveal that the robotic service exerted greater levels of sensory and intellectual experiences and generated low levels of experiences due to the affective dimension. The findings of this study further indicate that the robotic service attracted greater levels of affective experiences for midscale and budget hotels, and did not exert influence on luxury hotels. Generally, the service from the robot may not essentially generate brand experience as influenced by the moderating role of the hotel segment.

On the one hand, Haobin et al. (2021) determined the link between mindfulness and brand experience in the presence of hotel customers' length of stay as the moderator variable. The findings show that hotel customers' length of stay negatively moderated the relationship between mindfulness and brand experience. Khan and Fatma (2021) also determined the link between online destination brand experience and destination brand authenticity while culture was applied as the moderator variable. The results indicate that culture plays a big moderating role in the link between online destination brand experience and destination brand authenticity.

Furthermore, Jimenez-Barreto et al. (2020) also assessed the moderating effect of tourists' past experience with the destination on the link between the online destination brand experience and users' behavioral intentions toward the destination. The findings reveal that tourists who had not yet visited the destination offered a higher path in the link between online destination brand experience and behavioral intentions compared to tourists who had previously stayed at that particular destination. It was also confirmed that tourists who had previously stayed at the destination

revealed a higher path in the link between perceived online destination brand credibility. Nevertheless, Srivastava et al. (2022) studied the moderating effect of trust and brand loyalty in the link between brand experience and destination advocacy in India. The findings of this study indicated that trust and brand loyalty played a big role in moderating the link between the studied variables.

To sum up, the current review reveals that the majority of studies do not bother about the variables that may affect the direction or strength of the relationship between brand experience and other constructs. The reviewed articles have concentrated more on the antecedents and consequences of brand experience. This is the gap that needs to be filled by future research as the inclusion of moderator variables provides a chance of going beyond studying just a simple link between the two variables and for a fuller picture of real-world brand relationships. Moderators offer insights into the link that we could not otherwise attain without being included in the model.

Outcomes of brand experience in the tourism industry

The reviewed articles reveal that scholars have studied this topic in either customer-related effects or brand-related effects. The findings reveal that customer-related effects have been assessed in terms of customer satisfaction, intention to revisit, intention to recommend, behavioral intention, functional and wellness value, intention to continue, and intention to repurchase. Others include pro-environmental intention, word of mouth, product attribute, customer involvement, social customer perceived value, functional and financial perceived values, meaningfulness, and a positive memory. On the other hand, brand-related effects have been studied in terms of brand equity, brand personality, destination brand identification, brand trust, brand loyalty, perceived online destination brand credibility, brand image, destination brand advocacy, brand trust, destination brand authenticity, and brand love.

It was found that the majority of articles reviewed (9) have studied the effect of brand experience on brand loyalty followed by those that studied the effect of brand experience on customer satisfaction (7). For example, Phan and Ting-Yueh (2022) assessed the effect of brand innovativeness on brand loyalty via distinct dimensions of online brand experience in the online booking setting. The authors found that sensory, behavioral, and

affective experiences are the most determinant of loyalty towards brands. Liu and Hu (2021) also determined the impact of various hotel brand experiences on brand loyalty and revealed that hotel boarders' perceived brand experience influences brand loyalty. A study by Narimane and Lahcen (2021) examined the influence of brand experience on brand loyalty in traveling agencies and confirmed that brand experience had a significant influence on the formation of brand loyalty. Scholars like Liu et al. (2020) also evaluated the effect of brand experience on brand loyalty in upscale hotels for mainland Chines tourists. Their findings reveal that brand experience has a positive and significant effect on brand loyalty. Han et al. (2019) on the other hand found that brand experience influences brand loyalty through brand identification. Similarly, Seehanam et al. (2018) examined the effect of brand experience on brand loyalty and revealed that brand experience builds the loyalty of customers towards the brands. In addition, Kumar and Kaushik (2017) did a study regarding the role played by destination brand experience in evaluating the holistic and unified opinion of tourism destinations. The findings suggest that different dimensions of destination brand experience have a diverse effect on destination brand identification that consequently influences loyalty towards tourism destinations. However, the intellectual dimension did not reveal any effect on destination brand identification.

Nevertheless, Barnes et al. (2014) determined the influence of brand experience on satisfaction in a destination setting and showed the positive impact of sensory and affective experiences on destination satisfaction. However, intellectual and behavioral experiences did not show any impact on customer satisfaction. Singh and Mejraj (2019) also examined the influence of destination brand experience on the impact of destination brand experience on the behavioral intention of tourists. The authors found that destination brand experience influences tourists' satisfaction. Similarly, Wang et al. (2020) studied the effect of brand experience on satisfaction in the theme parking context and found that visitors' theme park experiences significantly exert an influence on the satisfaction of visitors. Martins et al. (2021) also determined the effect of destination brand experience on visitors' satisfaction. The findings indicate a positive impact of brand experience on visitors' satisfaction. Sensory experience exerted more influence compared to other experiences and the intellectual experiences did not exert influence on the satisfaction. In the same vein, Elvekrok and Gulbrandsøy (2021) evaluated the influence of individual

brand experience dimensions and found that sensory, cognitive, and affective experiences influence visitors' satisfaction towards destination brand.

Although destination brand experience influences brand loyalty and satisfaction, a review of the literature indicates that various dimensions of destination brand experience have a varied effect on these constructs. Studies confirmed that sensory experiences are more influential in generating satisfaction and brand loyalty in tourist settings whereas other experiences such as affective, behavioral, and intellectual experiences are weaker (Barnes et al., 2014; Kumar & Kaushik, 2017; Martins et al., 2021; Wang et al., 2020). It is more difficult to attain behavioral and intellectual experiences in the tourism setting (Barnes et al., 2014). Relationships such as those of intellectual experiences are more predominant in generating product experiences than in tourism destinations. These results establish that studies regarding the influence of brand experience ought to account for individual influences of brand experience dimensions. On the one hand, findings suggest that tourist agencies, destination marketers, tour guides, and other tourism stakeholders should invest more in generating experiences that touch tourists' senses than other experiences.

Interestingly, other outcomes of brand experience have been reported as summarized in Table 1. This list of brand experience outcomes suggests that experiences encountered from destination brands can influence many brand-related variables. However, future studies are welcomed to unveil more outcomes of brand experience to enrich the brand management literature.

Table 1: The Outcomes of brand experience in the tourism industry

Outcome	Study
Brand loyalty	Phan and Ting-Yueh (2022), Liu and Hu (2021), Narimane and Lahcen (2021), Liu et al. (2020), Han et al. (2019), Seehanam et al. (2018), Kumar & Kaushik (2017), Rahman et al. (2021), Srivastava et al. (2022).
Customer satisfaction	Barnes et al. (2014), Singh and Mejraj (2019), Wang et al. (2020), Martins et al. (2021), Elvekrok and Gulbrandsøy (2021), Elvekrok and Gulbrandsøy (2021), Rezaei et al. (2017)
Intention to revisit and recommend	Barnes et al. (2014), Chiang and Chen (2023), Kumar and Kaushik (2020), Mohamed et al. (2020)
Brand equity and brand personality	Kim et al. (2022)
Destination brand identification	Kumara and Kaushik (2017), Rather et al. (2020)
Behavior intention	Ahn and Back (2018) Jimenez-Barreto et al. (2020), Praswati et al. (2021), Singh and Mejraj (2019)
Word-of-mouth	Chukwunwem & Ndubueze, 2018; Gomez-Suárez & Veloso, 2020; Khan & Fatma, 2021
Functional perceived value and wellness perceived value	Ahn and Back (2019), Wiedmann et al. (2017)
Brand identification	Guo and Hsu (2023), Han et al. (2019)
Memory	Elvekrok and Gulbrandsøy (2021), Wang et al. (2020)
Repurchase intention	Odor and Okeke (2020)
Pro-environmental intention	Kwon and Boger (2020)
Perceived online destination brand credibility	Jimenez-Barreto et al. (2020)
Brand image	Liu et al. (2020), Liu and Hu (2021)
Destination advocacy	Kumar and Kaushik (2020), Srivastava et al. (2022)
Brand trust	Narimane and Lahcen (2021), Kang et al. (2017), Srivastava et al. (2022)
Affective commitment and destination brand authenticity	Khan and Fatma (2021)
Product attribute	Liu and Hu (2021)
Brand love	Lv and Wu (2021)
Sports event image	Girish and Lee (2019)
Involvement and meaningfulness	Legendre et al. (2019)
Multisensory marketing, social customer perceived value and financial customer value	Wiedmann, et al. (2017)
Brand attachment	Gomez-Suárez and Veloso (2020), Guo and Hsu (2023), Kang et al. (2017), Shang et al. (2020)
Actual spending behavior	Rezaei et al. (2017)
Flow experience, self-congruity and brand commitment	Fu et al. (2020)
Existential authenticity	Shang et al. (2020)
Brand knowledge	Kang et al. (2017)
Tourism citizenship behavior	Tang et al. (2023)
Trustworthiness and trust	Torres-Moraga and Barra (2023)

Methodology perspective

This systematic review also assessed the methodology used by the reviewed literature including the sampling techniques, the approaches and strategies, and the analytical methods used. The findings reveal that various sampling techniques have been applied by brand experience studies in the field of tourism. It was found that the majority of studies (20) used convenience sampling and fifteen (15) articles did not state the sampling techniques used. This becomes difficult for readers to know which sampling techniques were used in these studies. However, eight (8) of them used random sampling whereas judgmental sampling was utilized by one (1) article. Other techniques included Amazon Mechanical Turk which was applied by two (2) articles and Sojump which was used by one (1) article. The former is the feasible and generalizable sampling technique when a general population sample is required (Gerlich et al., 2018) and the latter is the professional online platform for data collection. These findings suggest that convenience sampling plays a big role in selecting respondents for brand experience studies. This may be because the convenience sampling technique is less expensive, faster, and easy to do compared to other forms of sampling. Despite its advantages, studies conducted by convenience sampling cannot be generalized. The findings can only be applied to the study sample and the relationships and influences found from this type of sampling cannot be generalized to a target population (Acharya et al., 2013; Stratton, 2021). This is because convenience sampling is subject to various forms of bias and is prone to statistical assessment of sampling error or statistical validity (Acharya et al., 2013; Stratton, 2021). Generally speaking, both convenience sampling, judgmental sampling, Amazon Mechanical Turk, and Sojumb are non-probability sampling. This calls for the use of probability sampling techniques that yield generalizable findings such as random sampling which seems to be infrequently used by scholars in tourism.

Interestingly, quantitative and qualitative approaches have been used in the reviewed articles. The results reveal that the majority of studies have applied the quantitative research approach (40) and four have applied the qualitative research approach (Elvekrok & Gulbrandsøy, 2021; Jimenez-Barreto et al., 2020; Liu et al., 2020; Singh & Mejraj, 2019). This suggests that the quantitative approach is the dominant research approach in brand experience studies particularly in the tourism industry.

On the other hand, the cross-sectional research strategy has dominated this field leaving the longitudinal strategy under use. It has been shown that only one (1) study by Lv and Wu (2021) in China dared to apply the longitudinal research strategy and the remaining forty (43) articles used the cross-sectional strategy. While the short-term influences and relationships of brand experience on various brand-related factors are well-established in the literature, the long-term influences and relationships are under-researched. Therefore, future research should consider integrating long-term influences and relationships of brand experience to gauge what is happening in the tourism industry.

Nevertheless, the measurement scale by Brakus et al. (2009) has been applied by the majority of studies. A total of thirty-six (36) studies used the scale (with four dimensions) although some of them used the scale plus additional other dimensions. For example, Jimenez-Barreto (2020) in Spain applied this scale and added a social aspect dimension whereas Liu et al. (2020) and Liu and Hu (2021) in China added ambience experience and recognition experience. Phan and Ting-Yueh (2022), on the other hand, added a relational dimension making a total of five dimensions. However, Mutsikiwa et al. (2020) did not apply the scale by Brakus et al. (2009) instead they used the Hotel brand experience scale by Rahman and Khan (2017) which comprises five dimensions namely hotel location, hotel ambience, staff competence, hotel website and social media experience and guest to the guest experience. The use of additional dimensions by different authors depending on the context applied suggests that the measurement scale by Brakus et al. (2009) does not suit all contexts and the nature of study objects. This calls for the development of other scales that may suit well to specific contexts and the nature of respondents. As has been revealed by some studies, intellectual and behavioral experiences do not suit well in tourism destination studies (Barnes et al., 2014).

In the case of analytical methods, a large part of the literature has used structural equation modeling (SEM). Specifically, thirteen (13) articles used SEM-Smart PLS, thirteen (13) articles used SEM without specifying the type of SEM used, whereas those utilized SEM-AMOS were eleven (11) articles. The majority of the articles which used SEM have also used confirmatory factor analysis (CFA), and exploratory factor analysis to aid in establishing the validity and reliability of the research constructs. It

was also found that the articles that used multiple regression analysis were six (6) and one (1) article utilized analysis of variance (ANOVA) together with multivariate analysis of variance (MANOVA).

The findings of this review confirm that except for a few articles, 84 percent of the published articles applied SEM. This might be because the majority of these studies have used the quantitative approach which requires the use of analytical techniques that establish causal relationships. Quantitative methods are good at alleviating individual bias and offer cherished insights into the ordering of reality and materialized discourses (Savela, 2018). They also allow replicating the study over time because of the standardized methods (Taherdoost, 2022). However, they are not able to give an in-depth understanding and in-detail information about the studied objects due to the inherently reductive nature of classification (Savela, 2018; Taherdoost, 2022). They are also limited in the provision of concealed reasons in persons' feelings, acts and individual's behavior at large. Thus, a mixed research method may be a good approach to gathering information related to tourists' experiences.

CONCLUSIONS, RECOMMENDATIONS, AND AREAS FOR FUTURE RESEARCH

This study aimed at determining the current state of brand experience literature in terms of theory utilized, journal distribution, country of research, and methodologies. It also determined the antecedents, mediators, moderators, and outcomes of brand experience in the tourism industry as well as identifying areas that should be addressed by future researchers in the field of brand experience. The current review has unveiled that one article was published in 2014 about brand experience in tourism in the searched databases and there was a gradual increase in the year 2017 and 2019 where five (5) and six (6) articles were published respectively. However, in the following year (2020) there was a twice increase of articles published equating to 12 articles. Thus, this study concludes that there is an increase in number of articles published regarding brand experience in the tourism industry.

On the other hand, this study revealed that different theories have been used in studying brand experience. However, the majority of the reviewed literature prefer to use social identity theory and Stimulus-Organism-Response framework while studying experiences encountered by tourists

from different destinations. From these findings, it is concluded that the social identity theory and Stimulus-Organism-Response framework are mostly used by brand experience researchers. This review also discloses that 54.5% of the reviewed articles applied the conceptualization and measurement scale of brand experience by Brakus et al. (2009). Hence, it is concluded that the conceptualization by Brakus et al. (2009) is the dominant viewpoint in brand experience research.

Country wise, this review divulges that majority of brand experience studies in the tourism industry have been done in the China (10) followed by USA (6), India (5) and Indonesia (3), South Korea (2) and Spain (2) whereas the remaining countries received one article each. Hence this study concludes that China is the major contributor of brand experience studies specifically in the tourism industry followed by USA, India and Indonesia. The review also shows that a large number of studies have favored the offline contexts, quantitative approach, and cross-sectional strategy. Thus, this review concludes that the majority of studies in brand experience particularly in tourism are mainly conducted offline, quantitatively in nature, and use a cross-sectional strategy.

It is also concluded from the findings that structural equation modeling is the leading analytical technique in brand experience research. For the case of sampling techniques, convenience sampling is mostly favored sampling technique over any other technique. The review also suggests that brand experience in tourism is influenced by many factors but it is also mediated and moderated by other customer-related and brand-related constructs. Brand experience also can influence many variables. Thus, this review recommends that, for tourist agencies and other tourism stakeholders to differentiate themselves from their competitors, they should invest more in building positive experiences from encounters with their customers. The study also recommends for further research to be conducted in this area particularly in tourism to have more insights about the relationships between brand experience and other related constructs.

Nevertheless, based on synthetization of the above-mentioned literature review, this review offers directions for future research by employing the theory perspective, context, characteristics, and methodology perspectives. Theoretically, the review reveals that various theories have been used to study brand experience in tourism. However, there is an

opportunity for future research to employ other theories such as social behavior theory, social exchange theory, and value co-creation theory. Future researchers are also welcome to work on brand experience conceptualization and operationalization (Andreini et al., 2019). Contextually, a large body of literature has concentrated on the offline context while leaving the online context unexplored. Hence, future studies coalescing offline and online studies are needed to elucidate how the two influence each other. More studies are also welcomed to examine how various online and offline touch points impacts each step of the consumer journey (Lemon & Veheof, 2016).

In the case of characteristics perspectives, several antecedents, mediators, moderators, and outcomes of brand experience have been identified. However, there is an opportunity for future research to explore more antecedents (such as technology interaction, green image, tourist attitude, self-image congruity, marketing communications, and physical characteristics of the location such as physical evidence and or servicescape), mediators (such as consumer's emotion such as joy and anxiety, tourists' need fulfillment, social accomplishments, brand competence, and brand aspirations), moderators (like brand loyalty, brand image, brand identification, brand authenticity, cultural orientations of tourists and ethnocentrism) and outcomes such as brand engagement, brand attachment, brand knowledge, willingness to pay and brand strength to mention a few.

Methodologically, quantitative methods have dominated the reviewed studies in the tourism industry. Hence, future research should give more emphasis on the importance of qualitative data collection techniques such as in-depth interviews in order to get more insight into the brand experience construct in tourism. The majority of researchers are also in favour of a cross-sectional research strategy over longitudinal and hence the short-term influences and relationships of brand experience on various brand-related factors are well-established in the literature whereas the long-term influences are limited. Thus, future researches are welcomed to examine the long-term influences and relationships of brand experience to gather more information about experiences from destination brands.

The review also indicates that the majority of the studies have concentrated on the use of non-probability sampling techniques in

particular convenience sampling. However, this technique is subject to various forms of bias and is prone to a statistical assessment of sampling error or statistical validity (Acharya et al., 2013; Stratton, 2021). This warrants future research to employ the probability sampling techniques which yield generalizable findings. Nevertheless, the review discovered that the measurement scale by Brakus et al. (2009) has been widely used by researchers. However, this scale does not suit all contexts, cultures, and the nature of research participants. The scale is more useful when testing experiences exerted on products. Consequently, researchers have pointed out that the experience dimensions such as intellectual and behavioral do not fit well in tourism destination studies (Barnes et al., 2014). Hence, future research may engage in the development of other scales that may suit well to specific contexts and the nature of respondents. Moreover, this review also exposes that, the reviewed literature has not considered the negative brand experiences which are likely to be encountered by tourists in different destinations. Hence future research are welcome to include this aspect. The concept of brand experience has witnessed an increased interest by scholars in recent years. However, there are few reviews on this area. This calls upon other reviews in the future which may consider shorter periods such as five to eight years etc.

Interestingly, this review has theoretical and practical implications. In the case of theoretical implication, the current review highlights the understanding of the relationship between destination brand experience and other customer-related and brand-related variables. More specifically, it unveils the antecedents, mediators, moderators and outcomes of brand experience in the tourism industry and hence extends the theoretical foundation of the relationships between brand experience and other variables. The findings reveal that destination brand experience influences various customer-related and brand-related variables. Based on the findings of this review, Figure 5 summarizes the proposed anatecedents, mediators, moderators and outcomes of tourism brand experience for future research. Practically, the review offers information that can be utilized by tourism marketers. The findings reveal that destination brand experience influences various customer-related and brand-related variables. Thus, tourism marketers can utilize various experiential factors such as sensory, affective, behavioral and intellectual experiences to build loyalty of customers, customer satisfaction, trust, attachment to the

brands, promote intention to revisit and recommend the brands. These experiential factors can also be applied to foster word-of-mouth recommendations, repurchase intention, brand commitment from customers, build the brand image and increase the actual purchase behavior of customers.

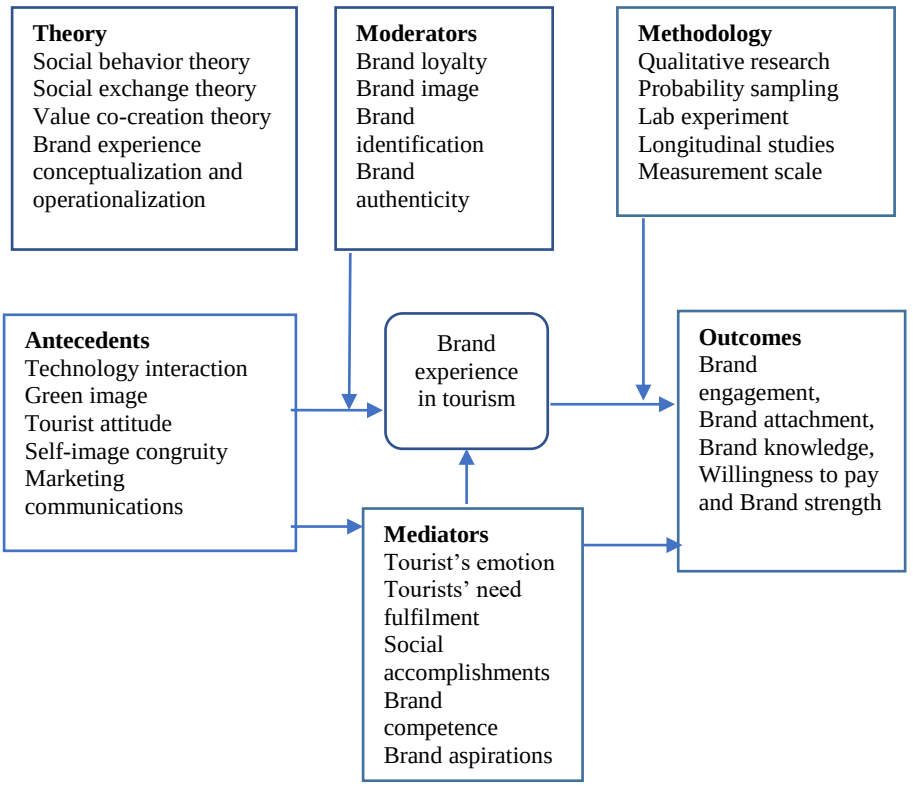

Figure 5: Proposed future research framework
Source: Author's research

LIMITATIONS OF THE STUDY

Although this study has come up with novelty findings, it has some limitations. For example, this study was limited to articles published in English and that found in the Taylor and Francis, Emerald, ScienceDirect and google scholar databases. Another limitation is the small sample size of the reviewed articles due to strict criteria used in selecting the articles

published in the databases utilized for a review. This strictness was applied to keep the objectives manageable (Pham et al., 2022).

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Market Policy Reforms and Education Quality in Public Higher Education in Tanzania: The Role of Quality Assurance Mechanisms

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Abstract
Globally, following financial austerity facing universities, many Higher Education (HE) systems have introduced Market Policy Reforms (MPR) as an alternative way of providing solutions on how states should finance higher education, increase access, and manage HE systems efficiently and effectively. The study used a qualitative research approach and a multiple case study design. Qualitative data collected from interviews, focus group discussions, and documentary reviews were subjected to content and thematic analysis. The study findings showed how mechanisms of quality assurance work to ensure quality in HE institutions. For instance, institutionalising quality assurance guidelines policies from the Tanzania Commission for universities is an essential mechanism that forces universities to comply with the set guidelines and circulars. Also, the directorates of Quality Assurance (QA) play a significant role in inculcating a culture of quality assurance practices to achieve the university's core mission. The implementation of MPR has influenced the access of a significant number of students, but expansion of access does not commensurate with available resources. The study recommends that at times of massification, external and internal QA mechanisms are indispensable for promoting and maintaining quality standards in HEIs.

Keywords: *Market Policy Reforms, Higher Education Institutions, Quality Education*

INTRODUCTION

Education quality in Higher education (HE) has been a subject of debate since the introduction and implementation of Market Policy Reforms

(MPR) in Sub-Saharan Africa higher education systems (Yang & McCall 2014; Varghese, 2013; Varghese, 2016) and Higher Education Institutions (HEIs) in Tanzania (Watengere, 2016). However, there seems to be a consensus that the origin of the most recent quality crises in higher education in SSA could be associated with the economic shocks that faced many countries on the continent in the 1970s and 1980s. The global economic crunch made governments to face balance of payments deficits so severe that had to accept short- and long-term credits under the WB and IMF Structural Adjustment Programmes (SAPs) (Boit & Kipkoech, 2011). Basically, the foci of SAPs were on macro-economic adjustments and adopting neo-liberal policies centred on the liberalisation of trade and foreign investments, deregulation, and privatisation (Kentikelenis, et.al, 2014). Macroeconomic adjustments entailed fiscal austerity measures including reducing public spending on social services to redirect the resources to the sectors considered key to stabilising macro-economic conditions (Gudo & Oanda, 2011).

The WB policy document, "Education in Sub-Saharan Africa: Adjustment, Revitalisation and Expansion (1988), building on the previous document, "Financing Education in Developing Countries: An Exploration of policy Options" (WB, 1986), employed studies on the rate of return to investment in education to advocate for directing resources to primary education away from higher education. A closely related policy document, "Higher Education: The Lessons of Experience" (WB, 1994) advocated for marketisation and liberalisation of higher education arguably it was unresponsive to the labour market needs, inefficient and expensive relative to its outputs. Consequently, public higher education systems in SSA were gradually underfunded by exchequers. The declining public subventions to recurrent and development budgets instigated the adoption of MPR in public higher education institutions with diversification of revenue sources, cost cutting, operational efficiency, productivity and responding to consumer demands featuring on the menu of their rolling plans' strategic objectives. This led to partial privatisation of public higher education institutions through cost-sharing, commercialisation of core functions and corporatisation of management and governance, euphemistically termed as Institutional Transformation Programmes (ITPs) (University of Dar es Salaam, 2015). With private sector participation and proliferation of private institutions higher education became competitive and expanded quantitatively to rates that SSA had never witnessed in decades (Yang & McCall, 2014; Varghese,

2016). In the long run, facilities, financial and human resource could not keep pace with the increasing number of students (UNESCO Institute of Statistics, 2018). This gave rise to concern about the quality of education services offered in higher education institutions and efficiency and effectiveness of higher education systems (Sonia & Rose, 2016). Demand for quality and accountability coupled by internationalisation of higher education marked the genesis of institutionalisation of quality assurance and control in SSA higher education systems and institutions.

The Tanzania context

Upon gaining political independence in 1961, the country prioritised investment in human capital for a sustainable economic base and efficient and effective government (Mkude, Cooksey & Levy, 2003). The Arusha Declaration of 1967 enunciated the political philosophy of socialism and self-reliance, and egalitarianism as an ideology to guide the country economic and social development initiatives, policies, and strategies. In that regard, public provision, and financing of social services, including higher education, became an incontestable obligation of the State (Mgaiwa & Ishengoma, 2017). However, by the 1980s the egalitarian redistribution policies were financially unsustainable due balance of payments deficit amidst large development and recurrent expenditures required to maintain capital investments and training the workforce to run and manage the social services, respectively.

The adoption of the IMF and World Bank mandated SAPs was a logical corollary of resuscitating the ailing macro-economic conditions. The IMF and WB respective conditionality for financial assistance compelled the Tanzania Government to adjust its macro-economic policies and embrace neo-liberal and market led policy reforms in all sectors including social services (Mgaiwa, 2018a). Through the Education and Training Policy (ETP) of 1995 and subsequently, the Higher Education Policy (HEP) of 1999, Tanzania liberalised its higher education by allowing and encouraging the private sector to establish and run private universities and other higher education institutions or in partnership with the government (URT, 2014). These policies recommended sharing higher education costs with the beneficiaries and improving funding through innovative income generation activities (Msigwa, 2016; Kossey & Ishengoma, 2017; Ngawaiya, 2018b). The aims were to supplement the diminished and unpredictable subventions from the State concerning the public provision,

expand access to, and improve the quality, efficiency, and effectiveness of higher education (Ngawaiya & Ishengoma, 2023).

The liberalisation of higher education culminated into an increase in the demand for higher education, consequently, the rise in the number of institutions offering the service. Available data shows that by 2018/2019 (National Bureau of Statistics [NBS], 2020), there were a total of 53 fully fledged universities, university colleges and campuses in Tanzania Mainland, of which 70% (N=38) privately owned and managed. This compares unfavourably with only 2 public universities available in the 1990s. Student enrolments also continue to rise year after year. For example, in the 2005/2006 academic year, the number was 40,993; it increased to 206,305 in 2009/2010; 225,330 in 2015/2016) and 229,049 (2018/2019) (TCU, 2018a; 2018b; NBS, 2020). Mgaiwa and Ponsian (2016) have attributed the expansion of access and diversity of academic programmes to Public-Private Partnerships; however, it does appear that the efficiency and effectiveness of higher education are adversely affected.

The government of Tanzania established the Commission for Universities (TCU) Universities through Act No. 7 of 2005, designated and mandated as an agency for university quality assurance (TCU, 2016). Higher education institutions have internal policies and mechanisms to ensure the quality of education in their respective institutions. Nevertheless, researchers (Makulilo, 2012; Mgaiwa & Ishengoma, 2017) doubt the quality of education provided in the country's proliferated universities, campuses, and university colleges because evidence shows that facilities, equipment, and human resource are unable to cope with expanding enrolments. Despite the institutionalisation of quality assurance mechanisms both at national and institutional levels there is evidence of poor students' academic performance. This is explained by a mix of interrelated factors on the inputs side and teaching and learning processes which signify deficiency in the internal operations of higher education institutions (UNICEF, undated). Consequently, an increasing number of graduates notwithstanding, stakeholders continue to question the quality of education offered in the HEIs, and that of the graduates (Mgaiwa, 2021a). Anecdotal experience and empirical evidence suggest that graduates lack essential competencies and employability skills for the competitive labour market (Awiti, 2014; Wetengere, 2016; Ishengoma & Vaaland, 2016; Amani, 2017; Mgaiwa, 2021b). When quantity and

quality of higher education collide, the quality of graduates tends to suffer the most.

It followed that since the adoption and implementation of MPR in Tanzania, little is known whether higher education meets the required quality standards or not. There are doubts as to whether the adopted reforms have had an envisaged effect on the quality of higher education. Therefore, the current study aimed to explore the practices employed in assuring the provision of quality education amid the implementation of MPR in public higher education institutions in Tanzania.

METHODOLOGY

The study used a qualitative research approach and a multiple case study design to explore the practices employed in assuring quality education Tanzania's public HEIs. Epistemologically, this study was located within the constructivist paradigm. Purposive sampling was used to select 44 respondents for this study, including ten (10) top university executive management officials (i.e., DVCs and Directors), two (2) Quality Assurance officials, sixteen (16) staff members and sixteen (16) university students from two (2) selected public universities (i.e., Mzumbe University (MU) and University of Dar es Salaam (UDSM) which are oldest universities and they have a history of implementing MPR through institutional transformation programmes. The population was chosen because were considered to have information about practices employed to ensure quality education during the implementation of MPR. Three methods (i.e., semi-structured interviews, documentary reviews, and focus group discussions) were employed for data collection. The collected data were subjected to content analysis. The intentions were to interpret and understand through categorised words, themes and concepts within the text and then analyse the results.

FINDINGS AND DISCUSSION

Quality Assurance mechanisms employed for the provision of quality education

The present study explored the influence of quality assurance practices employed in assuring the provision of quality education during the implementation of MPR in public HEIs in Tanzania.

Guidelines from the Tanzania Commission for Universities (TCU)

Our findings indicate that TCU requires universities to have a comprehensive and systematic framework that meets the minimum standards for the quality of programmes offered by respective universities and university colleges in the country. During interviews, it was established that adhering to the guidelines issued by the TCU occasionally serves as a mechanism for ensuring that institutions do not become degree mills. For example, one member of the academic staff had this to say:

> *We implement the MPR in line with the provided guidelines from TCU on minimum standards and qualifications of students for admission, qualifications of teaching staff and relevance of the curriculum, programmes and courses offered by academic* units (Interview: QA 04, 24th September 2020, HEI 'B,').

The above argument revealed that even though MPR have had influenced HEIs to provide opportunities for accessing and acquiring higher education, the deciding factor is the TCU set standards and benchmarks. HEIs are obliged to follow them if they wish to admit students, introduce new programmes, and employ teachers lest they compromise their registration and accreditation which are a mandate of the TCU (TCU, 2021)

Additionally, the quality of students admitted in the institutions depends on the minimum standards or entry points decided upon by TCU. This was confirmed by one of the quality assurance officers as follows:

> *TCU has published admission criteria for each academic programme at our university. There is no option for us to admit students without tagging the TCU* (Interview: QA 02, 19th September 2020).

This showed that TCU has an additional responsibility of assessing the quality of graduates of Advanced level secondary education defined as their performance in the examinations administered by the National Examinations Council of Tanzania (NECTA) before being admitted in the institutions. One aspect worth noting is that TCU administers application windows but the admission process and the decision of who can be admitted according to available spaces are vested with the respective institutions. Whilst TCU appears to be focused on the quality of students for admission into HEIs, our findings revealed that the number of students who are admitted invariably does not commensurate with the human and

physical resources available in the institutions. For example, regarding the requisite number of academic staff one of the respondents argued that:

> *"In these institutions, the number of students has increased tremendously while the number of staff has remained more or less constant and those in higher academic ranks are few… those in the professorial ranks many are retiring or have retired (Interview; Staff 04, 19th September 2020).*

This view was supported by another interviewee that:

> *Universities easily deploy academics of lower ranks including Tutorial Assistants and Assistant Lecturers, but these categories of human resources do neither have the experience nor enough capacity to carry out quality assurance processes such as institutional self-assessments, quality audits, external examination and conduct tracer studies"* (Interview: Staff 01, 15th October 2020).

The foregoing excerpts suggest that although TCU has a legal mandate of universities' quality assurance it does not deal with factors which affect the university's internal efficiency and effectiveness such as a shortage of senior members of academic staff. Available statistics show that tutorial assistants and assistant lecturers constitute about 70% of the total population of academics in the country (TCU, 2019). The emerging general picture is that inadequate funds necessitate the need to admit students in large numbers to generate income from tuition fees and direct costs payable to the institutions. This is a subtle agenda subsumed in the MPR broader goals of diversifying sources of revenue, cost cutting, operational efficiency, productivity, and response to consumer demands.

It appears that TCU and universities were focusing on student admissions which at best are proxies for quantitative expansion at the expense of the academic reputation of the institutions and things that really make a difference in the teaching and learning process such as quality of academic staff, physical facilities, and infrastructure. Yet, according to TCU (2016; 2021), it is mandated to make sure that there are improvements in the quality and quantity of academic staff, availability of teaching and learning resources and institutionalise the University Qualifications Framework (UQF) to curb academic fraud which could be occasioned by a surge in the number of institutions all competing for students.

The TCU mandates as a regulatory body are imperative for university education quality management. Nevertheless, available findings

(McDonnell & Elmore 1987; Mgaiwa, 2021) suggest that often it is hard to achieve goals of quality education in the universities through policy instruments and guidelines with externally mandated standards or procedures because these institutions are professional bureaucracies embracing the collegial and political models of governance. It is possible to argue that MPR have served to shift the locus of responsibility for quality higher education away from the State towards institutions which are labelled as 'providers', cashing on demand for higher education by students who are labelled as 'customers', in the higher education market regulated by TCU. The challenge is how to strike a balance between maintaining the academic core, which is the *raison dêtre* of public higher education institutions and pursuing commercialisation and entrepreneurial interests which are tenets of MPR.

The institutionalisation of Quality Assurance Policies

The study revealed that each institution has its own binding QA policy which guides the management of academic activities. One of the institution's QA policy documents states that:

> *"Like other universities which embrace quality assurance…. [The] University developed its Quality Assurance Policy in 2010… This enabled the university to systematically approach quality assurance to enhance the quality of training, research, community services, and internal support services."* (Documentary Review; HEI 'B', 2017, p. 8).

The statement above suggests that for any higher education to move towards the knowledge economy for the achievement of Education All (EFA) and Sustainable Development Goals (SDGs), the quality of education must be assured by the establishment of quality assurance systems.

The institutions' QA policy documents that were reviewed in the present study stipulate standard criteria for admissions, qualification of academics, acceptable workload, staff-student ratio, research, and public service to the community. The criteria were intended for quality checking, monitoring, and evaluating institutional performance while fulfilling their core mission of teaching excellence. For example, during interviews, one of the QA directors proffered the following:

> *...the directorate of quality assurance exists to put quality assurance systems and structures in place. They are supported with quality*

> *assurance policies for admissions, teaching, curriculum development and staff recruitment. As part of our commitment to QA in the country and region, our universities adhere to the East African Inter-University Council (IUCEA) protocol for quality assurance* (Interview: DQA 06, 30th September 2020).

The above quote indicates a consensus on establishing quality assurance systems and fulfilment of the Inter-University Council of East Africa (IUCEA) requirement, of harmonising quality standards for higher education within the East Africa region and in line with global quality standards.

One of the aims of the MPR in Tanzania is for public universities to produce graduates that are globally competitive and employable (URT, 2014). Therefore, higher education institutions are required to have internal quality assurance mechanisms as a key aspect of quality management. This was once highlighted by Mok (2000) that quality is an international concern that public and private universities must seriously handle. Therefore, institutional policies provide a general guide for monitoring and evaluating quality in all aspects of institutional operations to ensure they attain a high standard of achievement in their products.

Existence of Quality Directorates and Bureaus within HEIs

The implementation of MPR emphasises access and quality of products, factors which influence how students are prepared in the universities. In that regard, it is a requirement by TCU (2016) that all public and private universities have well-established QA units and departments that can monitor all processes of providing knowledge and skills for quality products. TCU (2021) outlines the functions and responsibilities of QA directorates. Among them is the implementation of university quality assurance policies for improving the quality of teaching, research and community outreach programmes offered by universities and to promote the development of a vibrant intellectual community. Another function is inculcating a culture of quality assurance in all university operations, safeguarding national and international academic standards and sustaining accreditation status.

Findings from this study revealed that the sampled institutions have QA directorates and units. It was also found that the directorates and units performed several functions to ensure the quality of teaching, research,

and consultancy services and that the university complies with the TCU guidelines in that regard. One member of the academic staff lamented the following:

> *Our university QA bureau was established to ensure that quality is maintained by checking the quality of every university activity… including staff, their qualifications and programmes that are offered in the institutions… (Interview: Staff 03, 14th September 2020).*

The foregoing was supported by a quality assurance official who said:

> *The quality assurance directorate is here to monitor, coordinate and supervise all teaching and learning processes at the university* (Interview: QA 02, 7th October 2020).

The above narrations signify a motive behind establishing quality assurance directorates and departments in higher education institutions which is to achieve and maintain quality standards in carrying out their day-to-day mandated role of constantly monitoring and evaluating quality assurance processes. The findings have shown that one critical role of the directorates is to determine the extent to which internal quality standards for measuring performance in core operational areas of the university are met and updated.

However, despite the critical role played by directorates, bureaus, departments or units, nomenclature notwithstanding, the findings further revealed that the institution's budget allocations were inadequate to cater for the operational costs of QA activities. In most cases allocated funds are not disbursed as planned. Arguably, the unpredictability of funding to QA directorates is one of the sources of directorates' inefficiencies and ineffectiveness.

In addition, the findings indicated that there were quality assurance committees found in schools, colleges, and faculties. The main function of these committees is to ensure the provision of quality education in their respective units. A top executive management officer summarised the significance of these committees in this way:

> *Quality assurance committees work as internal auditors by monitoring and supervising academic activities that are supposed to be done in the colleges, schools, and departments. For example, if lectures are not offered, student seminars are not conducted, and course evaluation forms*

> *are not collected… they will come back to you and ask what happened? Because of that, things have changed; we have weekly attendance logs, therefore when it comes to the first week of the semester… we usually start teaching on the very first day; because of failure to do so, internal QA auditors will come and ask you to detail your absenteeism…* (Interview: VC 01, 9th October 2020).

The excerpt above implies that the functions of quality assurance committees have had an influence on the quality of education provided in higher education institutions. In this regard, one can argue that the outcomes of MPR on the quality of higher education hinge crucially on the effectiveness of internal QA mechanisms including quality assurance committees. This argument concurs with TCU's (2006) guidelines that require institutions to have effective quality assurance management systems.

Overall, whilst the directorates, bureaus, departments, and units vested with QA are key internal institutional QA mechanisms, the scope of their activities is narrow in the sense that they are exclusively focusing on university teaching and examinations-related activities with less vibrancy in other aspects of universities mission with respect to research and public service. They tend to report inadequacies, but institutions have poor responsiveness to addressing issues raised in the QA reports. More importantly, the directorate, bureaus, departments, and units do not have funds of their own but rely on institutional funding. Apparently, this seems to be a conflict of interest. The University management which funds QA activities is the one which must implement the recommendations of QA reports. Closely related to that observation, directors of QA are appointees of University Management.

Provision of teaching and learning resources

The findings revealed that adequate teaching and learning resources is a key factor for quality education. Academic and non-academic members of staff who were interviewed attested that non-availability and inadequacy of teaching and learning resources may affect quality improvement. For example, one of them said:

> *Honestly speaking, as the number of admitted students increases…the number of students in my class also expands. However, the teaching environment and materials facilitating the teaching process remain the same…* (Interview: Staff 01, 17th September 2020).

Similarly, other interviewees said:

> *Physical facilities and infrastructure are available however are not enough compared to the number of students, which affects academic activities…We also use E-learning which is not easy to accommodate all the demands…* (Interview: Staff 05, 4th October 2020).

> *… It is easy to admit students, but it is not easy to build structures in a short period because it needs a lot of money and a big budget…because of that universities have inadequate infrastructure amid exploded enrolments…* (Interview: Staff 06, 10th September 2020).

Furthermore, a student also commented on the inadequacy of physical resources and its implication on the quality of education offered:

> *…Buildings are not enough, and they cause discomfort to students to learn. For example, there is a time when you are forced to stand outside at the window and listen to a lecture because of the lack of space in the classroom…Lecture halls are overcrowded...* (FGD: Student 02, 4th October 2020).

The above narrations generally suggest that although the implementation of MPR has significantly increased student access to higher education, the inadequacy of physical infrastructure as an input to the teaching and learning process has primarily affected the quality of education offered in the higher education institutions. The notion of facilities capacity utilisation was beyond the scope of the present study; however, the above findings support the assertion by Barrett and Sorensen (2015) that teaching and learning resources are among the most crucial aspects that may influence better quality education in any education system. These findings further align with Ishengoma's (2007) arguments that student enrolment expansion should match the expansion of educational facilities to realise the quality of education in higher education institutions.

CONCLUSION

The implementation of MPR in higher education has occasioned a quest for quality practices. Therefore, the present study examined the mechanisms employed by higher education institutions for quality management. From the findings, the mechanisms include institutionalising TCU quality assurance guidelines, developing quality assurance policies, establishing quality assurance directorates, and

providing teaching and learning resources. The institutionalisation of TCU quality assurance guidelines ensures the universities comply with regional and international higher education quality standards. Directorates, bureaus, departments, and QA units are a cog in the wheel of inculcating the culture of quality assurance in the university's core mission. Whilst the implementation of the MPR has significantly increased students' enrolment into higher education institutions, significant expansion of access apparently does not commensurate with available resources. This has adversely affected the quality of education offered in the institutions and, subsequently the products of higher education system in Tanzania.

RECOMMENDATIONS

In the light of the above conclusions, the following recommendations are proffered: First, implementing quality assurance practices is the mechanism of assuring quality in higher education. The institutions must build a quality culture by institutionalising effective quality assurance policies and guidelines. Second, the institutions must comply with externally mandated QA mechanisms such as those from TCU and IUCEA. Third, the QA is a huge undertaking that must be allocated enough resources to be effective. Finally, TCU, as a regulatory agency for university education and institutions' leadership should occasionally improve QA guidelines and policies in response to demands of emerging QA practices and culture.

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Effectiveness of Offline Video-Based Biology Instructional Materials on Students' Performance in Secondary Schools

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Abstract
This study investigated the effectiveness of offline video-based instructional materials in enhancing students' academic performance in biology lessons in selected secondary schools in Dar es Salaam. The study used holistic multiple case study and quasi-experimental research designs to collect both qualitative and quantitative data using structured questionnaires, interviews and tests. A total of 2 teachers from school A and school B (i.e. one from each school) and 168 students (i.e. 84 from each school) were purposively selected to participate in the study. Analysis by SPSS and data reduction techniques have revealed that offline video-based instructional materials are effective in enhancing students' academic performance in biology in the experimental groups from both schools (P=0.0001) and made students quite positive about learning biology (89.3%) - 97.6%,). As perceived by students, the enhanced academic performance is the result of improved classroom interactions due to the materials. Specifically, the use of offline video-based instructional materials improved interactions between students and biology teachers, amongst students through group activities and between students and the learning resources. Furthermore, the materials enhanced *students' interest in biology (94.0%), and understanding of concepts (92.9%) and made them retain more biology concepts (94.1%). Based on the findings, appropriate recommendations for policy, action and future research are suggested.*

Keywords: *Offline video-based instructional material, Biology, School, Teaching and Learning*

INTRODUCTION

Efforts to integrate different offline video-based instructional materials in education to enhance students' academic performance are widely reported in literature (Voogt, 2010; Collis & Moonen, 2001; Nihuka, 2008; Kafyulilo, 2013; Agyei &Voogt, 2012). Specifically, studies indicate that offline video-based instructional materials are used in education to address a number of challenges of the traditional instructional materials that confront the teaching and learning of biology in secondary schools in most developing countries.

As perceived by students, one of the major challenges of traditional instructional materials is lack of effectiveness in enhancing learning and promotion of academic performance (Kuenzi, 2008 and Olivos-kati, 2006). Another challenge of traditional instructional materials is ineffectiveness in promoting students' interest for learning, in-depth learning and understanding of difficulty concepts in science subjects including biology in secondary schools (Olivos-kati, 2006). Also, as perceived by students, traditional instructional materials are un-motivating and make them lose interest for the subjects because they don't promote in-depth learning and proper understanding of difficult concepts (Makter & Michael, 2011; Kuenzi, 2008 and Olivos-kati, 2006). Furthermore, as reported in literature, challenges of lack of text books, libraries, ICT infrastructure and shortage of competent biology teachers in secondary schools make the learning of biology using traditional instructional materials even worse (Unwin, 2005; Unesco, 2009; Speering & Rennie, 1996).

Studies indicate that majority of students in secondary education are positive to use offline video-based instructional materials and other ICT-supported materials for learning (Kigobe, 2013; Tagoe, 2012; Senzige & Serukesi, 2003; Kafyulilo, 2013). Specifically, as perceived by students, ICTs including offline video-based instructional materials enhance effective students' learning and improvement of academic performance in science including biology (Bude, 1995). This is because offline video-based instructional materials provide opportunity for students to actively engage with the content anywhere and anytime provided they have access to computer or related device (Goh & Fraser, 1998). Additionally, offline video-based instructional materials contribute to critical thinking (Richards, 1999; Alousa, 2007).

Evidence indicate that offline video-based instructional materials contribute in nurturing confidence, critical thinking, self-learning and development of cognitive, psychomotor and affective behavior in students (Choi & Johnson, 2005). They also promote reflective learning as a result of students' engagement with the content (Choi & Johnson, 2005; Aless & Trollip, 2001). Where offline video-based instructional materials are effectively used in biology learning, they contribute to effective students' learning and improved academic performance (Guskey, 2000; Joyce & Showers, 1995; Nihuka, 2011). Offline video-based instructional materials challenge students to develop higher attention span than when traditional instructional materials are used (Choi & Johnson, 2005). According to Choi and Johnson (2005), offline video-based instructional materials help students remember important concepts more easily because they promote simultaneous processing of both auditory and visual information.

Experience from studies indicate that when properly used, offline video-based instructional materials are effective in promoting interest for biology, in-depth learning, access to learning resources and improvement of students' academic performance (Onyegegbu, 2008), language development and cognitive development (Voogt, 2010; Collis & Moonen, 2001). They are also used in secondary schools to address challenges such as lack of reliable internet connectivity, lack of libraries, lack of instructional materials and other text books and lack of advanced digital skills among students and teachers, among others (Terna, Samson & Abdullah, 2018; Ambrose, 2012; Chonjo et al, 1996; Leeuw, 2003; Mokter, 2011 & Unwin, 2005).

The following are the critical conditions that make integration of offline video-based instructional materials in education in the context of developing countries such as Tanzania feasible. First, presence of supportive policies that guide the use of technologies in education. Specifically, the United Republic of Tanzania (URT) through the Ministry of Education, Science and Technology (MoEST) has put in place ICT Policy for Basic Education (URT, 2007) in addition, the Education and Training Policy (URT, 2004) to guide video-based instructional materials integration in secondary schools. Among other things, the said policies create conducive environment for integration of ICT including offline video-based instructional materials in education as a pedagogical tool for teaching and learning to enhance equitable access to learning

resources by students and teachers and facilitation of students' learning and improvement of academic performance in schools (URT, 2007).

Also, as required by policies, technology integration in education is part of the curriculum in Teacher Training Colleges (TTCs) in the country. This is important because such a curriculum equip student-teachers with relevant practical skills about technology integration in teaching (Kigobe, 2013 & Senzige, 2003). Second, presence of basic ICT infrastructure available in some secondary schools which are necessary for integration of offline video-based instructional materials for teaching and learning in secondary schools. Such ICT infrastructures include tablets, computers, projectors and televisions (Kigobe, 2013; Nihuka, 2013 & Senzige, 2003).

However, evidence on the effectiveness of offline video-based instructional materials in enhancing *students' learning and academic performance in biology in the context of secondary schools* in Dar es Salaam are just emerging (Kafyulilo, 2013; Kigobe, 2013; Senzige & Serukesi, 2003). Therefore, the main focus of the study reported in this paper was to investigate the effectiveness of offline video-based instructional materials in enhancing students' *academic performance in biology in secondary schools.* This is because offline video-based instructional materials may be useful in addressing challenges of shortage of learning resources in the context of secondary schools in the country.

OBJECTIVE OF THE STUDY

The main objective of the study was *to investigate the effectiveness of offline video-based instructional materials in enhancing students' academic performance in biology in selected secondary schools in Dar es Salaam.* Specifically, the study addressed the following specific objectives:

i) To explore students' experiences with the traditional teaching and learning of biology.
ii) To examine challenges encountered by students in the traditional learning of biology.
iii) To investigate students' experience with offline video-based instructional materials in learning biology, and
iv) To assess contribution of offline video-based instructional materials in enhancing students' academic performance in biology.

METHODOLOGY

Design of the Study

The study employed *holistic multiple* case study and *quasi- experimental* research designs. A holistic multiple case study was adopted because two independent schools were studied, each as a unit (Yin, 2000) and *quasi-experimental* design was used because the study included experimental and control groups.

Sample and Sampling Technique

A sample of 168 students from biology streams school A and B (actual names withheld) (i.e 84 students from each school) participated in the study. The sample was drawn using purposive sampling technique and only one stream participated in the study as experimental group and the other as a control group in each school.

Instrument for Data Collection

The study used the following four instruments for data collection: *structured questionnaire, interview schedule* and *Test.* The *structured questionnaire* comprised of closed-ended questions where students were required to tick against specific statements provided in a Likert scale (as *Strongly Disagree*, *Disagree*, *Agree* and *Strongly Agree*). *The interview schedule* comprised of open-ended questions where students responded accordingly and responses recorded using audio recorder. The *Test* instrument contained questions aligned to lesson objectives which students were expected to demonstrate mastery at the end of the lesson. Both, *SPSS and Data Reduction Technique* (Miles & Huberman, 1994) were used to analyze quantitative and qualitative data accordingly.

FINDINGS

Students' experiences with traditional instructional materials

Findings on students' experiences with traditional instructional materials in biology learning (in Table 1) indicate that 78 students (92.8%) find materials as interesting. However, students reported several concerns when using the traditional instructional materials during biology learning; limited group activities (43; 51.2%), teacher dominancy (33; 39.3%), delayed timely completion of syllabus (59; 58.4%) and limited practical during biology lessons (49; 49.3%).

Table 1: Students' experiences with traditional instructional materials

	Responses (N= 84)	
Experience	**Freq**	**%**
Traditional instructional materials are interesting	78	92.8
Limited group activities	43	51.2
Teachers use teaching aids	35	31.7
Teacher- centered approach is dominant	33	39.3
Copying notes is common	33	39.3
Limited time for questions	22	26.2
Syllabus not completed on time	59	58.4
Lack of competent teachers in biology	24	28.6
Lack of interest to read books	28	33.3
Limited practical	49	49.3

An independent sample t-test analysis was conducted to compare students' experience with the traditional instructional materials between the two schools. Findings (Table 2) indicate that students at School A experienced limited time for questions ($p<0.05$) and lacked competent biology teacher ($p<0.05$).

Table 2: Comparison of students' experience with traditional instructional materials

	Responses (N = 84)				
	School A		School B		
Experience	**Freq**	**%**	**Freq**	**%**	**T- test**
Traditional instructional materials are interesting	19	70.4	8	26.9	t(82)=-0.985, p>0.05
Few group activities	20	57.1	15	42.9	t(82)=0.721,p>0.05
Teachers do not use teaching aids	13	53.1	9	40.9	t(82)=0.010,p>0.05
Teacher-centered approach is dominant	49	22.2	14	77.8	t(82)=-2.92p>0.05
Copying notes is common	1	11.1	8	88.9	t(82)=-5.79p>0.05
Limited time for questions	3	17.6	14	82.4	t(82)=-5.01,p<0.05*
Delayed finishing of syllabus	13	52.0	12	48.0	t(82)=-5.23,p>0.05
Lack of competent biology teacher	4	33.3	8	66.7	t(82)=-5.02,p<0.05*
Lack of interest to read books	9	56.3	7	43.8	t(82)= 0.69, p>0.05
Limited practical work	16	50.0	16	50.0	t(82)=-1.96,p>0.05

Note: * = *Statistically significant difference*

Challenges of traditional instructional materials

Challenges that students encountered when using traditional instructional materials in biology learning were also investigated. Findings (Table 3) indicate that students encountered challenge of lack of biology text books for reference (52; 61.9%), limited practical work (52; 53.6%) and limited

use of library (60.7%). Furthermore, students encountered challenge of limited learning resources (45; 53.6%) and lack of computers to support learning (60; 71.4%).

Table 3: *Challenges encountered by students when using traditional instructional materials*

	Responses (N= 84)	
Challenges	**Freq**	**%**
Lack of interest to learn biology	12	14.2
Lack enough biology text books for reference	52	61.9
Limited practical	52	61.9
Limited use of library	51	60.7
Difficult to learn biology concept	17	20.3
Limited learning resources	45	53.6
Lack of interactions with biology teacher	31	36.9
Big class size (over 100 students/class)	35	41.6
Limited group discussions	38	35.3
Lack of computers to support learning	60	71.4
Boring teaching methods	26	31.0

A comparison of the challenges as perceived by students in the two schools (Table 4) indicate that students in School A lack interest in traditional instructional materials, have limited practical, experience big class size and lack computers to support biology learning unlike their counterparts in School B ($P<0.05$ in favor of School A). On the other hand, students in School B lack biology books and other learning resources compared to their counterparts in School A ($P<0.05$ in favor of School B).

Table 4: Comparison of challenges of traditional instructional materials

Challenges	**Responses (N=84)**				
	School A		**School B**		
	req	**%**	**Freq**	**%**	**T-test**
Lack of interested with traditional instructional materials	5	83.3	1	16.7	$t(82)=2.285$, $p<0.05$*
Lack of enough biology books	10	43.5	13	56.5	$t(82)=-3.643$, $p<0.05$*
Limited practical	17	53.1	15	46.9	$t(82)=-3.182$, $p<0.05$*
Limited use of library by students	7	41.2	10	58.8	$t(82)=-1.715$, $p>0.05$
Dislike the way biology is taught	5	38.5	8	61.5	$t(82)=0.725$, $p>0.05$
Difficult to learn biology concepts	9	64.3	5	35.7	$t(82)=1.009$, $p>0.05$
Lack of interactions	7	36.8	12	63.2	$t(82)=-0.458$, $p>0.05$
Big class size (over 100)	13	83.3	3	16.7	$t(82)=5.382$, $p<0.05$*
Limited discussions	15	60	10	40	$t(82)=0.467$, $p>0.05$
Lack of computer to support T/L	7	58.3	5	41.7	$t(82)=2.582$, $p<0.05$*

Note:*= *Statistically significant difference*

Students' experience with offline video-based instructional materials

Findings on students' experience with offline video-based instructional materials in biology learning (Table 5) indicate that students are positive about the materials (89.3% - 97.6%). Offline video-based instructional materials enhanced students' interest in learning biology (79; 94.0%), promoted understanding of biology concepts (78; 92.9%) and recommended the materials to be used by other biology teachers (82; 97.6%)..

Table 5: Students' experience with offline video-based instructional materials

	Responses (N= 84)	
Experience	**Freq**	**%**
Offline video-based instructional materials enabled understand of biology concepts	78	92.9
Made simple to understand difficult biology concepts	75	89.3
Offline video-based instructional materials helped to learn more about biology	79	94.0
Offline video-based instructional materials increased interest in biology	79	94.0
Offline video-based instructional materials enhanced comprehension of concepts	75	89.3
Retained more biology concepts when offline video-based instructional materials are used	79	94.1
Liked learning using offline video-based instructional materials	79	94.0
Use of offline video-based instructional materials to be compulsory for other teachers	82	97.6

Findings from interviews with students echo those presented in Table 5. Specifically, as perceived by students, *"offline video-based instructional materials improved the learning of biology compared to traditional instructional materials".* According to students*, "lesson which used offline video-based instructional materials were more engaging with full of group activities unlike in the lessons which used traditional instructional materials, the said materials enhanced understanding of biology concepts due to practical observations, increased confidence, concentration and prevented dozing in class".*

Comparison of students experience with offline video-based instructional materials between the two schools (Table 6) indicate that students in School A found the materials made the understanding of difficult biology concepts easier and increased interest to learn biology than their counterparts in School B($P<0.05$ in favor of School A).

Furthermore, students in School A reported that the level of comprehension of biology was enhanced and could retain more biology concept as a result of the materials unlike their counterparts in School B ($p<0.05$ in favor of School A.

Table 6: Comparison of students experience with offline video-based instructional materials

	Responses (N=84)				
	School A		School B		
Experience	**Freq**	**%**	**Freq**	**%**	**T-test**
Offline video-based instructional materials made me understand biology more	12	92.3	1	7.7	t(82)=-2.85,p>0.05
Easier to understand difficult concepts	16	84.2	3	15.8	t(82)=3.78'p<0.0*
Offline video-based instructional materials helped learn more about biology	15	88.2	2	11.8	t(82)=-2.84,p>0.05
Offline video-based instructional materials increased interest for biology	15	93.8	1	6.3	t(82)=3.09,p<0.0*
Enhanced level of biology comprehension	11	57.9	8	42.1	t(82)=-3.11, p<0.05*
Retained more biology concepts	29	83.3	4	16.7	t(82)=-2.10, p<0.05*
Liked offline video-based instructional materials	7	77.8	2	22.2	t(82)=-1.67,p>0.05
Use of offline video-based instructional materials should be compulsory	11	91.7	1	8.3	t(82)=-1.60,p>0.05

Note: * = *Statistically significant difference*

Contribution of offline video-based instructional materials on students' academic performance

Findings from test (Table 7) indicate that students in the offline video-based instructional materials in both schools performed significantly better compared to their counterparts in the control groups (M = 34.8% v/s M = 30.3% in School A and M = 30.8% v/s 39.9% in School B: p<.0001). However, comparison between the experimental groups in the two schools indicated that, students in School B performed better

academically (M = 58.3%; SD = 1.1) compared to their counterparts in School A (M = 34.8%; SD = 0.4).

Table 7: Contribution of offline video-based instructional materials on students' performance

Schools	Students' Academic Performance (N= 84)						T-Test
	Experimental Group			Control Group			
	n	M	SD	n	M	SD	
School A	46	34.8	0.4	46	30.3	0.05	t(84)=-125.0418, p<0.0001
School B	38	58.3	1.18	83	39.9	0.02	t(84) =-303.9208, p<0.0001

As perceived by students, *the improved academic performance is the result of the enhanced interactions due to offline video-based instructional materials during biology learning*. Specifically, *the use of offline video-based instructional materials enhanced interactions with biology teacher who gave us* (students) *the opportunity to seek for further clarifications about concepts unlike when traditional instructional materials are used.*

Also, as indicated by students, *offline video-based instructional materials enhanced interactions amongst students through group activities where we engaged into discussion about specific concepts and issues related to biology. Also, we* (students) *got opportunity to note down own conclusions for sharing in plenary discussion during the lesson. Offline video-based instructional materials enhanced interactions between students and learning resources where we* (students) *were able to address questions that were provided during the lesson.*

CONCLUSIONS AND DISCUSSION

The study reported in this paper investigated effectiveness of offline video-based instructional materials in enhancing students' academic performance in biology learning in selected secondary schools in Dar es Salaam. Findings have indicated that in the context of the study, offline video-based instructional materials are effective in enhancing students' learning and improvement of academic performance in biology learning in the experimental groups in both schools.

As perceived by students, the improved academic performance is the

result of the enhanced interactions due to the use of offline video-based instructional materials in biology learning. Specifically, the use of offline video-based instructional materials enhanced interactions between students and the biology teacher, amongst students through group activities and between students and learning resources. According to Richards (1999) and Alausa (2007), learning interactions are essential for effective learning and improvement of students' academic performance. This indicates that offline video-based instructional materials improved significantly the teaching and learning of biology in the selected schools. Similar findings are also reported in previous studies by Cox (2003a); Pittard (2003); Harrison (2002) and Passey (2004).

Findings have also indicated that students in one of the selected schools encountered several challenges when using traditional instructional materials, which included limited practical, big class size and lack of ICT infrastructure such as computers compared to the other school that experienced lack of biology books and learning resources. Generally, traditional instructional materials make students lack interest for biology and experience poor academic performance (Unwin, 2005; Unesco, 2009; Ambrose, 2012).

Furthermore, as a result of offline video-based instructional materials, majority of students in both schools were positive about biology learning. According to students, the instructional materials enhanced their interest for biology, promoted their understanding about difficult biology concepts and therefore recommended for other biology teachers to also integrate similar materials in their lessons.

Furthermore, students have indicated that offline video-based instructional materials made learning of biology further improved compared to when traditional instructional materials are used because the approach engaged them with activities which enhanced their understanding. This conclusion corroborates to that by Choi and Johnson (2005). According to Choi and Johnson (ibid), offline video-based instruction enhance students' attention span and help them remember important concepts.

Based on the findings from this study, relevant recommendations for policy, action and future research are suggested. In terms of policy, there is need for review of the current National Education Act to accommodate

ambitions about educational technologies integration as stipulated in the revised National Education and Training Policy (2023 version) to improve teaching and learning processes in schools. This is because findings have indicated that technologies such as offline instructional materials are effective in enhancing students' learning and academic performance.

For action, there is need for teachers in biology and the rest of the subjects to integrate offline video-based instructional materials in teaching and learning of their subjects. This shall enhance classroom interactions and improve students' learning and academic performance. There is also need for further research to investigate the use of online video-based instructional materials to enhance learning flexibility in tertiary education in the context of Tanzania.

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Assessment of Teaching Approaches Employed by Teachers in Teaching Students with Visual Impairment in Tanzania Inclusive Secondary Schools

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ABSTRACT
This study assessed the teaching approaches employed by secondary school teachers teaching in inclusive classrooms incorporating students with visual impairment in Tanzania. The aim of the study was to find out the extent to which the approaches suited the students' learning needs. The study adopted a qualitative research approach, employing a single case research design. Purposive sampling procedures were employed to obtain a sample of 24 respondents. Data were collected through semi-structured interviews, non-participant observations and documentary reviews. The collected data were analyzed through thematic data analysis procedures and presented using descriptions, tables and charts. The findings have revealed that some of the teaching approaches executed by teachers accommodated the learning needs of students with visual impairment, while others did not. It is recommended that teachers should adapt teaching approaches that suit students with visual impairment. Further, the government should organize more regular trainings and professional development courses for raising teachers' awareness on inclusive issues.

Keywords: *Inclusive education, Teaching approaches, visual impairment.*

INTRODUCTION

Teaching encompasses a set of principles and ideas which have to be followed by teachers in the teaching and learning processes. It is the teacher's role to ensure that students learn properly through appropriate

teaching approaches. Further, the success of inclusive education depends on effective implementation of inclusive teaching and learning which includes teachers' awareness on inclusion as well as quality instructions (Peebles and Mendaglio, 2014; Rushahu, 2017; Siu and Morash, 2014). It is therefore necessary for teachers of students with visual impairment (SWVIs) to teach in accordance with the students' requirements bearing in mind that teachers have a central role of responding to the diverse learning needs of all students in inclusive classrooms (Kisanga and Richards, 2018; Loreman, Sharma and Forlin, 2013; Masanja, 2016; Mwakyeja, 2013; Possi and Milinga, 2017). This implies that, inclusive classroom teachers have to be aware of the unique learning needs of SWVIs and modify their teaching approaches as well as strategies accordingly.

BACKGROUND TO THE PROBLEM

Successful inclusion requires teachers to apply teaching modalities that consider the needs of each student. Those with visual impairment (SWVIs) in particular, require adaptive and modified curricula, teaching and learning strategies. as well as resources which can accommodate their unique learning needs in relation to visual impairment.

Adaptive teaching strategies include; cooperative teaching, collaborative learning, availability of learning materials in advance for transcription, use of tactile diagrams, verbal communication, spelling out complicated vocabularies, allowing students to audio-record during instructions, placing SWVIs on the front seats, as well as teaching in a well illuminated classroom or using enlarged prints in writings and diagrams for students with low vision (Chitiyo and Brinda, 2018; Kija, 2017; Possi and Milinga, 2017; Vollinger and Supanc, 2019). Unfortunately, some teachers employ the dominant conventional teaching strategies that do not consider the unique learning needs of SWVIs. Such strategies include 'talk and chalk' as well as lecture methods. At times some teachers appoint at students using words like 'you', without mentioning their names (Kisanga and Richards, 2018; Mwoma, 2017).

Teachers in inclusive classrooms are also required to apply differentiated instructional techniques and tailored instructions to meet students' individual learning needs (Mastropieri and Scruggs, 2018). Through these instructions, instructors proactively can revise or modify instructional methods and learning activities to address the needs of individual students

and maximize their learning experience (Kharade, Ha and Ubale, 2017; Mastropieri and Scruggs, 2018; Tomlinson, 2014).

Teachers are supposed to have relevant skills that enable them to employ proper teaching approaches that guarantee effective learning of SWVIs. This is only possible if such teachers are trained on how to handle inclusive issues of children with disabilities in inclusive classrooms. Teachers with knowledge on inclusion have more confidence and commitment in accommodating students' needs in inclusive settings and are capable of adapting appropriate teaching approaches (Campbell, Gilmore and Cuskelly, 2014; Magushi, 2013; Muyungu, 2015). If not well equipped with such knowledge and skills, teachers are likely to be restricted from providing appropriate support for effective learning of SWVIs (Mcloughlin and Lewis, 2018). The situation may lead to stress among those teaching in inclusive classes (Rushahu, 2017). Masanja (2016) comments on the same that teachers are supposed to be competent enough, with relevant skills for effective participation in teaching processes despite the fact that such skills alone do not guarantee successful learning of SWVIs.

It is unfortunate that most teachers lack knowledge and skills of translating inclusive teaching-learning theories into meaningful classroom practices. They fail to consider the unique learning needs of SWVIs during instructional processes. and end up employing general approaches and resources in inclusive classrooms with SWVIs due to lack of adaptation skills (Kisanga and Richards, 2018). Likewise, various studies on the provision of inclusive education in Tanzania have reported that majority of teachers teaching in inclusive educational institutions in Tanzania have not attained training on teaching and handling matters of SWVIs (Kisanga, 2017; Kisanga and Richards, 2018; Masanja, 2016; Mhagama, 2014; Mwakyeja, 2013; Rushahu, 2017). It was therefore important to look into the extent to which teachers use appropriate approaches to cater for the learning needs of SWVIs in secondary school inclusive settings.

Purpose of the Study

The overarching purpose of this study was to assess the exactness of the teaching approaches employed by teachers in teaching students with visual impairment in inclusive secondary schools in Tanzania. Specifically, the study sought to examine the types of teaching

approaches used by teachers during teaching and learning of SWVIs in inclusive classrooms and the manner in which the approaches were employed. Secondly, the study explored the extent to which appropriate teaching approaches employed by teachers in inclusive secondary school classes accommodated SWVIs.

Theoretical Framework

The analysis and discussion of the findings of this study was guided by a framework adapted from the Social Model of Disability (SMD), which holds that disability is a social construct in which barriers to physical access, attitudes, and mindsets disable them. The main assumption of the model is that disability is the situation that is imposed on people with impairments, who become disabled not by their impairments, but by their society which excludes them from full participation in various activities (Avramidis and Norwich, 2016; Oliver, 1996; 1990; Owen, 2015; Scruton, 2016; Trussler and Robinson, 2015). The situation prohibits and excludes people with disabilities from participating fully and on equal terms in mainstream society. This means that, according to social model practitioners, the environmental factors can lead to barriers to school access and participation and contribute to the child's learning difficulty and disability in general (Owens, 2015; Scruton, 2016; Trussler and Robinson, 2015).

This implies that, limited knowledge on disability and irrelevance of the support provided may prohibit students' full participation and persistence in learning (Owens, 2015). It may also prevent teachers from providing the most suitable approach in enhancing the access and ability of students to learn. Students with impairment are therefore supposed to be considered when planning and executing teaching. In so doing, teachers can be able to employ appropriate and friendly approaches to the students. It is for this reason that SMD, being a major driver for inclusion, was applied in looking at teachers' understanding and expertise in responding to educational needs of SWVIs.

METHODOLOGY

This study employed a qualitative research approach under the constructivism philosophical paradigm. A case study design was used to obtain in-depth information for this study. The choice of this methodology was grounded on the nature of the research problem, which demanded for the detailed information from the respondents that could

otherwise not be obtained through deployment of other designs as asserted by Bryman (2016), Denscombe (2014) and Yin (2014).

The study was conducted in Korogwe Girls' Secondary School, in Korogwe Urban District Council, located in Tanga region. The sample size of the study was twenty-four respondents, including five teachers (RAs), eight SWVIs (RBs), eight sighted students (RCs), and three school officials (RDs). The participants were selected through purposive sampling technique. School officials included academic teacher (RD1), chief transcriber (RD2) and headmistress (RD3).

Multiple data gathering methods, which included semi-structured interview, non-participant observation, documentary review and semi-structured interviews were employed. The instruments were used to obtain data from all 24 respondents. A total of twenty observations were conducted in classrooms during instructional processes which involved five teachers who were teaching five arts subjects (English, History, Geography, Kiswahili and Civics), SWVIs and sighted students. In addition, through documentary review the researcher read a variety of documents, including teachers' schemes of work, lesson plans and lesson notes. The data obtained from the instruments were analysed through qualitative data analysis procedures reflecting on the purpose of the study and presented narratives tables and charts.

Presentation and Analysis of the Study Findings

This section presents and analyses data on the teaching approaches used by teachers in Korogwe Girls' inclusive Secondary School classes, the manner in which the approaches were employed, as well as the extent to which the approaches suited the learning needs of SWVIs. The findings have established that, teachers teaching in inclusive classes incorporating SWVIs used various teaching approaches. It was revealed from interviews with the respondent's non-participant observations and document review that teachers in Korogwe Girls' Secondary School mainly employed questions and answers, group discussions, lecturing and think-pair-share teaching approaches.

It was also revealed that some of the teaching approaches employed by subject teachers during instructional processes did not accommodate the learning needs of SWVIs. Further, some of the approaches were unfriendly to the students because they were not appropriately adjusted to

suit the teaching and learning needs of SWVIs. Most of the subject teachers lacked proper skills on special needs education leading to a negative impact on the learning of SWVIs. Noteworthy is that there were teachers knowledgeable in Braille as well as transcribers specialized in visual impairments who were available to give assistance to subject teachers who failed to adjust their teaching approaches accordingly. However, the former could not give assistance since they were not consulted,

On the other hand, findings showed that there were some teaching approaches which were prominently employed in inclusive classrooms to accommodate SWVIs. For example, questions and answers approach as well as group discussions appeared to be more suitable for teaching SWVIs compared to other approaches. When asked to comment on the approaches employed by the subject teachers, respondents explained that some of the approaches were helpful to SWVIs because they involved them in discussion, asking and answering questions.

Questions and answers approach

During interviews, three out of five teachers (RAs), four out of eight SWVIs (RBs) and one out of eight sighted students (RCs) reported that teachers used the question and answer approach for teaching SWVIs in inclusive classes. It was further explained that, during the teaching process, some teachers commenced with asking oral questions to students on what they had presented, and then pointed at some students to respond to the given questions by mentioning their names. To confirm on this, RA1 reported:

> *I normally use the question and answer as well as group discussion approaches. When employing the question-and-answer approach in teaching, I ask some oral questions to the students so as to get a picture of their understanding of the lesson. I normally call the student I want to respond to my question using his or her first name*.

However, there was an observation that most teachers used unsuitable phrases when choosing SWVIs to respond to oral questions. For instance, the teachers were not mentioning students by their names. They instead pointed at the selected students to respond to the asked question without mentioning their names. Implicitly the SWVIs were not considered during the teaching and learning process. Interestingly, the sighted students took

the responsibility of notifying the SWVIs who were pointed out to answer specific oral questions as indicated in the following caption by RB5:

> *When a teacher asks oral questions during the lesson, he/she picks one student to provide the answer by using words/phrases like "…you, give the answer…". Then, if it is me who is pointed at, a sighted student sitting next to me informs me that I am the one selected to respond to the question. Normally, if I know the answer, I stand up. Then the teacher allows me to respond to the question.*

Group discussion teaching approach

Two out of five teachers (RAs), seven out of eight SWVIs (RBs) and five out of eight sighted students (RCs) reported that teachers employed group discussion approach when teaching in inclusive classrooms incorporating SWVIs. Some respondents confirmed that teachers were using group discussion approach in specific teaching sessions and not all the time.

Four out of seven SWVIs and three out of five sighted students, who reported on the use of group discussion approach, confirmed that the approach was appropriately employed by their teachers. They also reported that, to a large extent, the teaching approaches employed by their teachers suited their learning. It was reported that in some subjects, teachers placed the SWVIs with their sighted students group discussions so that they could assist and support each other. Furthermore, the approach promoted bonds among the two categories of students. Having SWVIs discussing and learning together with their sighted peers in groups appeared to be beneficial to SWVIs as it enhanced their learning. To confirm this, the RB4 asserted as follows:

> *There is one of our teachers who sometimes teaches us through group discussions whereby we discuss with our fellow students without visual impairment and present the findings before he makes clarifications in front of the class. This somehow helps us to understand what he teaches.*

In addition, it was reported that, when using the group discussion approach, some teachers organize students in small groups comprising sighted students and SWVIs. The students in each group discuss together before presenting their work to the whole class. This allows students to assist each other during learning. It was also reported that during presentation, some teachers ensured that they picked SWVIs in each discussion group to present what had been discussed to avoid discrimination.

However, three out of the seven SWVIs and two of out the five sighted students, who reported on the use of group discussion approach, revealed that the approach was not appropriately employed by the subject teachers. The respondents reported that, the use of group discussion approach did not help SWVIs because of lack of close supervision from the teachers and laziness among SWVIs. When employing this approach, some teachers were reported to have the tendency of leaving students to control their groups without being monitored. At the same time, some teachers were not keen enough to combine sighted students with SWVIs in their groups during group discussion teaching method. They allowed the students to create their own discussion groups randomly without supervision. The approach did not guarantee inclusion of both categories of students in each group and active participation of the students hence negative impact on SWVIs, especially those who seemed to be lazy. To confirm on this, the RC2 said as follows:

> *Sometimes, a teacher uses group discussions when teaching us. But there is lack of concentration span and seriousness among students with visual impairment when a teacher employs group discussions technique in teaching us. This is a big problem that restricts our understanding of the lesson compared to when employing question and answer approach. Through the latter, a teacher gets immediate response from a student who is supposed to answer a given question orally. So, I think question and answer approach is the best one.*

Further, SWVIs encountered a problem of limited cooperation from the sighted students when their teachers employed the group discussion approach. Despite the fact that some teachers were making sure that in every group there was inclusion of sighted students and at least one SWVI so that they could discuss together, the kind of cooperation that sighted students gave to SWVIs was questionable. It was also reported that, in spite of having interaction between them, some sighted students were not willing to give cooperation to SWVIs. In addition, the issue of providing extra time allowance to SWVIs was not considered when employing this approach. The situation limited their participation, and made it very difficult for them to understand the lesson.

On the other hand, it was reported that some teachers arranged students according to their abilities instead of focusing on how students with and without visual impairment could participate and assist one another during

group discussions. The focus was on ensuring that slow learners are helped and benefit from fast learners. This denied the right of SWVIs to get support of visual inputs from their fellow sighted students.

Lecturing approach

Regarding the approach, three out of five interviewed teachers (RAs) confirmed that they employed lecturing approach during their teaching in inclusive classes which incorporated SWVIs. Likewise, four out of eight SWVIs (RBs), three out of eight sighted students (RCs) as well as two out of three school officials (RDs) reported that teachers employed the lecture method in their teaching. However, it was reported that the approach was used occasionally because of its inconveniences when employed in inclusive classes that included SWVIs.

Additionally, the respondents showed disapproval on the relevance of lecturing approach by claiming it did not accommodate learning needs of SWVIs as it made them inactive during the lessons. It was also reported that, sometimes, the approach was improperly employed and constrained understanding of lessons among SWVIs. During the interviews, respondents explained that sometimes SWVIs were prohibited to use their braille machines in taking notes for the reason that the machines were too noisy to be tolerated by students when a teacher was teaching. It was said that the approach denied the right of SWVIs to write down some points and take notes like their fellow students without visual impairment during the instructional processes. As a result, they forgot some parts of the contents which had been taught. The RC7 reported as follows:

> *The use of lecturing approach causes inconveniencies to students with visual impairment because students are not allowed to write using their braille machines when a teacher is teaching. They are to write notes after the teaching session. This causes the students with visual impairment to miss some important information in their notes because it is hard for them to memorize and recall what the teacher has taught.*

The respondents reported further that, using lecturing method seemed to be challenging to SWVIs since a teacher, in some occasions, writes on a chalkboard without verbalizing which raises a demand for sighted students to read for SWVIs what is being written on the board. However, it often happens that sighted students normally jot down some points using their pens while SWVIs listen only. It therefore becomes difficult for them to get notes of the taught subject.

In addition, it was reported that some teachers were very fast in presenting their lessons through lecturing in inclusive classrooms that included SWVIs. The respondents explained that the teachers' speed rate was very fast and affected the understanding of SWVIs in various lessons. Even when they were allowed to write using their braille machines during the teaching and learning processes, the notes of SWVIs had a lot of spelling errors because the teachers were very fast when teaching. Besides, SWVIs were not availed the chance to ask for clarifications on spellings of some vocabularies because the teachers were reluctant to do so. Even when asked to repeat reading what they had presented, some teachers refused, complaining that they did not have enough time to do so.

On the other hand, the respondents reported that, to some extent teachers employed lecturing teaching method appropriately. For instance, it was reported in the interviews with the respondents that some teachers verbalized as they were writing some points on the chalkboard to enable SWVIs be aware of what was written. Besides, the teachers' voices were reported to be loud enough to be heard by everyone in the class. This enabled all students from different angles of the class, including those with visual impairment, to hear well. In line with this argument, RC1 substantiated as follows:

> *The teaching approaches employed by teachers in our school enhance learning of students with visual impairment because teachers speak out loudly while they are teaching. This enables a student with visual impairment to understand the lesson well and be aware of what is going on in the class during instructional processes in spite of their being visually impaired.*

The Think-pair-share approach

It was reported by some respondents that, on several occasions, some teachers were employing the *think-pair-share technique* when teaching SWVs in inclusive classrooms. In spite of being employed during instructional processes, the respondents reported that there was less involvement of sighted students in assisting SWVIs in attaining their learning. At times it happened that teachers created small groups of two students in each group, when employing a think-pair-share approach, without paring SWVI with the sighted ones. The situation brought about some difficulties in learning among SWVIs especially when teachers used chalkboards to write questions and notes of some points without

verbalizing them. The situation made some of the SWVIs to be left out during the lesson. To confirm this, RB8 said:

> *When teaching us, it so happens that a teacher pairs a blind student with the one with low vision. They sit close to each other for the purpose of discussing what is being taught. This enforces a student with low vision to take the responsibility of reading for a student with blindness what the teacher has written on the chalkboard, while it is obviously known that it is difficult for an individual with low vision to see clearly what is written on the board like what a sighted student could otherwise see. This affects our learning so much.*

In addition, teachers' schemes of work accessed during documentary review indicated several types of teaching approaches that were planned to be used for teaching in inclusive classes in the 2021 cadmic year. The approaches include question and answer, group discussions, lecturing, think-pair-share technique, demonstration, brainstorming, debates, guest speakers, book reading and analysis, comprehension and drama. The review of twenty lesson plans indicated that the teaching approaches used by teachers during instructional processes included questions and answers, group discussions, lecturing, think-pair-share and demonstration. Tables 1 and 2 show the types of teaching approaches planned to be used by subject teachers as reviewed in their schemes of work and lesson plans.

Table 1: Teaching Approaches Planned to be Used by Teachers as Indicated in Schemes of Work

S/N	Subject	Class	Planned methodologies
1	Civics	Form IV	Questions and answers, group discussion, brainstorming, think-pair-share technique, debate method and using guest speakers
2	English	Form III	Reading aloud, brainstorming, questions and answers, debates, and group discussions
		Form IV	Reading texts, demonstration, think-pair-share technique, questions, and answers, group discussions, brainstorming and debates
3	Geography	Form III	Group discussion, lecturing, brainstorming, think-pair-share technique, demonstration and questions and answers
4	History	Form III	Reading texts, group discussion and questions and answers
		Form IV	Reading texts, group discussions and questions and answers
5	Kiswahili	Form III	Questions and answers, lecturing and group discussions
		Form IV	Questions and answers, lecturing and group discussions

Table 2: Teaching Approaches Employed by Teachers as Indicated in Teachers' Lesson Plans in Different Subjects

S/N	Subject	Class	Planned methodologies
1	Civics	Form IV	Questions and answers, think-pair-share technique and group discussions
2	English	Form III	Questions and answers
		Form IV	Questions and answers, think-pair-share technique and demonstration
3	Geography	Form III	Lecturing, demonstration, questions and answers and think-pair-share technique
4	History	Form III	Questions and answers
		Form IV	Questions and answers and group discussions
5	Kiswahili	Form III	Questions and answers, lecturing and group discussions
		Form IV	Questions and answers, lecturing and group discussions

On the other hand, from non-participant classroom observations, the researcher identified several types of teaching approaches that were employed by teachers in inclusive classrooms and the extent to which those approaches were appropriately applied. The findings showed that, many of the applied approaches were irrelevant and inappropriately used in different subjects at different times. On some occasions, some teachers managed to employ them properly. The approaches included questions and answers, group discussions, lecturing, demonstration and think-pair-share. Table 3 presents the teaching approaches used and their irrelevancy.

Table 3: The Relevancy of the Teaching Approaches Employed by Teachers in Inclusive Classrooms that Incorporated SWVIs during Non-participant Observations

S/N	Approaches	Status	Subjects					Total
			Geography	History	Civics	English	Kiswahili	
1	Questions and answers	Applied relevantly	1	-	4	4	3	12
		Applied irrelevantly	-	4	-	-	1	5
2	Group discussions	Applied relevantly	-	1	2	-	1	4
		Applied irrelevantly	-	-	-	-	-	-
3	Lecturing	Applied relevantly	3	-	-	-	-	3
		Applied irrelevantly	-	-	-	-	2	2
4	Think-pair-share	Applied relevantly	1	-	2	1	3	7
		Applied irrelevantly	-	-	-	1	-	1
5	Demonstration	Applied relevantly	3	-	-	-	-	3
		Applied irrelevantly	-	-	-	1	-	1

DISCUSSION OF FINDINGS

Using the Social Model in teaching and learning requires proper adjustments for SWVIs to be able to access, persist, participate fully, and progress successfully in their learning (Avramidis and Norwich, 2016; Oliver, 1990; 1996; Owen, 2015). It is true that teacher's awareness on inclusion issues has a great role in determining the level of support provided to SWVIs. This entails that, limited knowledge on disability and irrelevance of the support provided may prohibit the students' full participation and persistence in learning. It also prevents teachers from providing the most suitable approach in enhancing students' access and ability to learn.

Consequences of visual impairment can range from missed opportunities in learning to obstacles to gaining independence and active participation (Kija, 2017). It is therefore necessary for teachers to recognize that each SWVI is unique with unique learning needs that vary depending on the nature, severity and timing of visual impairment. It consequently requires application of different approaches to meet the needs of each individual with special educational needs.

The findings of this study show that teachers teaching in inclusive classrooms incorporating SWVIs did not depend on a single approach in teaching. The collected data from interviews, non-participant observations and documentary review have indicated that teachers adopted a variety of teaching approaches in teaching. The finding concurs with what Kisanga (2017) asserts that, a teacher should not entirely depend on using a single teaching approach in that there is no teaching approach which is absolute in itself. This implies that teachers using more than one teaching approach leads to complement of students' learning. However, despite the fact that most of the aforementioned approaches were employed in accordance with the needs of subjects taught, some of them were not employed relevantly. Noteworthy is that in some occasions, the way some of the teaching approaches were employed facilitated and enhanced learning of SWVIs while others did not.

The study findings have also revealed that questions and answers, as well as group discussion approaches were appropriately employed in most cases in such a way that they supported and facilitated the learning of SWVIs. The findings have shown that the approaches make SWVIs to be active participants and confident. They allow them to discuss together,

share ideas, ask questions and respond to questions freely during instructional processes. With the use of question-and-answer approach, data indicated that to a certain extent SWVIs participated fully and actively in the classrooms and were allowed to ask questions wherever necessary. Responding to questions asked enhanced their learning.

Through the group discussions approach, SWVIs were somehow given chances to share some of the teaching approaches with their fellow sighted students and presented what had been discussing, hence learning in the same way as their fellow sighted students. This is in line with the Social Model of Disability which upholds that teaching approaches to be used in inclusive settings have to vary and be modified to accommodate unique learning needs of SWVIs in order to facilitate their engagement in learning (Avramidis and Norwich, 2016). These results support the findings by Mwoma (2017) who states that SWVIs require teachers' use of a range of teaching approaches, which involve different sensory stimulations such as sounds, touches, smells, textures and shapes. This helps SWVIs to build a picture of the world around them, hence, effective learning.

On the contrary, some teachers were reported to be using teaching approaches which were not participatory in nature. The approaches included lecturing which inhibited learning of SWVIs. The findings have also revealed that lecturing approach to teaching is less supportive and less helpful to the learning of SWVIs in inclusive classes. It has also been revealed by respondents that lecturing makes SWVIs passive during teaching-learning processes thus enhancing cramming and rote learning by SWVIs. The findings are consistent with what have been revealed by Kisanga (2017), Mhagama (2014), and Possi and Milinga (2017) that, some of the teaching approaches and strategies employed by teachers in inclusive classes are not friendly to SWVIs. The authors add that, despite the fact that inclusive classes include SWVIs, most teachers tend to use ordinary teaching approaches and strategies such as lecturing and "talk and chalk," to present their lessons as if the classes involve sighted students only.

Previous studies have demonstrated that, employing general teaching strategies, such as 'talk and chalk' method, lecture method and mentioning a student by pointing at him or her, denies teachers from considering the unique learning needs of SWVIs during instructional

processes (Chitiyo and Brinda, 2018; Kija, 2017; Mwoma, 2017; Kisanga and Richards, 2018; Vollinger and Supanc, 2019).

The studies have recommended that, teachers who teach inclusive classes which involve SWVIs should employ adaptive teaching and learning strategies such as cooperative teaching and collaborative learning rather than using conventional teaching strategies. Looking at these studies, one learns that the conventional/general teaching approaches inhibit learning of SWVIs.

Another finding showed that, some of the approaches used were not modified to suit the learning needs of SWVIs, leading to limited participation of SWVIs into the lessons which made them to be inactive and unconfident. The findings concur with the assumptions of SMD which proclaim that limited knowledge on disability and irrelevance of the support provided to learners with disability have adverse consequences to the teaching-learning process of students with special educational needs (Owen, 2015). This is contrary to what Masanja, (2016), Mastropieri and Scruggs (2018) and Sharma, Armstrong, Merumeru, Simi and Yared (2018) who recommend that success in the provision of inclusive education for SWVIs depends much on the adaptation of teaching and learning approaches. The authors emphasize upon making a paradigm shift from non-participatory approach which is a traditional teaching, to modern teaching that involves interaction between a teacher and a student, where different needs of students are considered. It is for this reason that teaching in inclusive classes with SWVIs requires to be more individualised compared to the ones used in normal classes with few diversities among students. It is therefore important that teachers establish special pedagogical approaches that involve using alternative enhanced teaching and learning modalities.

Generally, the findings show that the teaching approaches being employed by teachers in teaching inclusive classes incorporating SWVIs in Korogwe girls' secondary school, and the way they are employed, do not accommodate the learning needs of SWVIs. Some of the approaches seem to be helpful and appropriate in teaching SWVIs in some of the subjects but are unsuitable in other subjects. All in all, teachers should properly select and employ appropriate teaching for the learning needs of SWVIs. Students with special education needs, including those with visual impairment learning in inclusive classes require teachers to apply

distinctive teaching methods and adapted approaches to suit each student according to his/her learning difficulties, needs and expectations as asserted by Mwoma (2017).

Teaching strategies and approaches to be used for SWVIs strategies ought to be modified according to severity of visual disabilities among the students. This suggests that SWVIs require unique ways of addressing their academic problems. In this regard it is important for teachers to predetermine effective teaching approaches for teaching SWVIs. This is in line with Mwoma (2017), who upholds that teachers should adopt teaching approaches such as sounds, smells, textures and shapes which allow SWVIs to use different sensory stimulations so as to help them build a picture of the world.

Summary of the Study

This study was conducted to assessed the teaching approaches employed by secondary school teachers teaching in inclusive classrooms with students with visual impairment to find out the extent to which the approaches suited the students' learning needs. A qualitative research approach through aa single case research design was used to obtain the necessary data. Data were collected using purposive sampling procedures whereby 24 respondents were used for data were collection through semi-structured interviews, non-participant observations and documentary reviews. Thematic data analysis procedures were employed and data were presented using descriptions, tables and charts. The From the findings it has been revealed that some of the teaching approaches used by teachers accommodated the learning needs of students with visual impairment.

CONCLUSIONS

In light of the main findings, the following conclusions are drawn:

Firstly, most of the teachers teaching inclusive classes that incorporate SWVIs lack requisite competences (knowledge and skills) on special needs education. With this limited awareness, such teachers are not at good position to plan, structure and modify teaching approaches to meet the learning needs of SWVIs in inclusive classes. Secondly, the study has revealed that, most teachers teaching in inclusive classes wich incorporate SWVIs use teaching approaches which are not modified to suit the learning needs of SWVIs. Instead, they are mostly employing ordinary teaching approaches that are less appropriate to SWVIs. Finally, the study has revealed that, teachers teaching SWVIs via inclusive classes

encounter several challenges during teaching. Such challenges reduce their efficiency in teaching and affect learning of SWVIs.

RECOMMENDATIONS

The study provides the following recommendations for action, policy and further research:

Firstly, the government should train and equitably deploy teachers who are qualified to teach SWVIs. Besides, enough awareness should be raised to teachers who teach inclusive classes which incorporate SWVIs. This can be done through organising regular in-service trainings and professional development courses to teachers. In so doing, such teachers will develop the ability to accommodate them during teaching-learning processes.

Secondly, teachers teaching inclusive classes that incorporate SWVIs have to adopt appropriate teaching approaches which accommodate those students. Teachers should therefore make proper modifications to those approaches and ensure that the approaches are applicable to SWVIs. The approaches will facilitate effective teaching and learning of SWVIs.

Finally, since the scope of the study was confined to one inclusive public secondary school, with the possibility of leaving behind some of the issues in this area of study that are equally important and need to be explored, the study thus recommends for another study of the same nature to be conducted in more inclusive secondary schools in Tanzania. The proposed study will be wider in scope and thus providing a comprehensive picture of the findings featuring the national level.

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Utilization of Fiscal Resources in Fee-Free Education Policy: The Case of Selected Community Secondary Schools' Heads in Tarime Urban District

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Abstract
This study investigated the capacity of heads of schools in utilizing the fiscal resources for implementing fee free education policy (FFEP) in community secondary schools. The study employed descriptive research design with a quantitative approach where stratified sampling technique was used to select a sample size of 190 respondents. Questionnaires were used to collect data and SPSS served as an analysis tool in interpreting the collected data. The findings revealed that heads of schools supervise and monitor the expenditure of school funds as per government directives and financial regulations although they do not provide accurate financial information of their schools. On the other hand, the study found that heads of schools do not properly keep records of staff in planning and allocation of fiscal resources related to implementing FFEP. The study concluded that although heads of schools do not delegate the mechanism of financial matters to capable staff, the prioritization of financial allocation according to the needs, helped successful implementation of the FFEP. The study recommends that heads of schools should keep records of staff properly in planning and allocation of fiscal resources for implementing FFEP. This goes together with the heads of schools giving accurate financial information of their schools and involving important stakeholders in decision making and matters concerning school budget.

Keywords*: Fee-free education policy, fiscal resources, community secondary schools.*

INTRODUCTION

Investing in education leads to faster growth of developed and newly industrialized countries (Adan & Orodho, 2015). Many Sub-Saharan Africa including Tanzania are now paying attention to investing in

education and improving primary, secondary, and tertiary levels. Both developed and developing countries consider primary and secondary as essential basic education and a right of every modern citizen (Ikediugwu, 2016). Investment and improvement in education is done in levels including primary, secondary as well as tertiary level (Opoku et al. 2020). Secondary education is an important part of the educational interventions as it is transiting the primary education to tertiary education. However, the main challenges in the level of secondary education in Tanzania and other sub Saharan Africa seem to be the academic performance particularly in community secondary schools.

The demand for secondary school education has been increasing due to the increase in the enrolment of pupils in primary schools. In Tanzania, for instance, primary school education increased enrolment from 59% in 2005 to around 90% in 2011 (Mbawala, 2017). This is because the government abolished all primary school fees, thus making the starting point of implementation of the Primary Education Development Plan (PEDP). These reforms aim to enhance both access to primary education and the quality of teaching. The PEDP was the latest major effort in this area which started in 2002. The PEDP aimed to deliver sustainable, basic education of high quality to all by making education affordable after abolishing school fees and all mandatory parental contributions for all the children. It also aimed to enhance enrolment and strived to improve education quality (Ndunguru, 2018). Despite the efforts made in 2001 only 4.5 million out of 7.5 million children in primary schools were enrolled (United Republic of Tanzania (URT), 2016).

The Secondary Education Development Plan (SEDP) was a ten-year plan that was carried out in two stages (2004-2009 and 2009/2010-2014). Higher enrolment numbers in primary schools created upward pressure for places in public secondary schools as part of the PEDP. SEDP, once again, put important policy pledges in the Vision 2025 and the National Strategy for Growth and Poverty Reduction (NSGRP), into action. The SEDP goals were to promote access, equity, quality, education management system improvement, management reforms, and the devolution of authority (Abdul, 2019). According to Ikediugwu (2016), the awareness of the relationship between education and the economic development of a country has influenced many countries to offer free primary and secondary education. Thus, many countries have decided to introduce various policies that provide free education to students.

In December 2015, upon taking office, the late President John Magufuli announced the government's decision to abolish all fees and additional financial requirements up to Form IV. The abolition of school fees is one of the most important action taken by the government to implement its ambitious education goals. The measure was preceded by the new 2014 Education and Training policy, which provides for 10 years of free and compulsory primary and lower-secondary education (URT, 2015a) that aimed to increase access to primary and secondary education and to improve the quality of education. These goals are in line with the Sustainable Development Goals (SDGs), a United Nations initiative that sets a target for all countries to offer all children free, equitable, and quality primary and secondary education by 2030. The goals are also in line with Tanzania's international and regional human rights obligations to realize the right to primary and secondary education for all.

The trends show that education has been a national priority for successive Tanzanian government since independence and school heads are considered as of more important to the country's efforts to implement new reforms and plans at the school level. However, education reforms require heads of schools to do their work diligently and allocate their time and other resources in new ways and learn new skills (Manaseh, 2016).To that end, the government began to pay capitation grants (monthly funds) to public secondary school bank accounts with additional money to cover running costs per student enrolled as a move to reduce corruption in local governments. Previously funds were distributed through district councils in their jurisdictions. Analysis conducted by the policy forum shows that secondary schools only received TZS 12,000–15,000 instead of the TZS 25,000 required in capitation grants. The government also reportedly did not disburse funding to cover infrastructural costs (URT, 2016).

In response to FFEP, according to the secondary education development programme document, heads of secondary schools are responsible for supervising the teaching programme, ensuring high quality teaching and learning, effective use of time for the entire school day, and a conducive teaching and learning environment (Mbawala, 2017). In addition, heads of schools play a major role in preparing school development plans and budgets, managing the day-to-day activities in a school, and maintaining school records, such as financial, academic and discipline records (URT, 2016). In short, heads of schools are expected to supervise all academic,

administrative, and management issues in schools (Government Education Circular Number 3 of 2016).

However, the effectiveness of heads of schools in implementing FFEP in Tanzania has been questioned by various studies such as Mwakalukwa (2019), who challenged on how heads of schools implement the policy to cope with implementation challenges. In addition, Abdul (2019) challenged the implementation of 2014 education policy in attaining quality education in FFEP in Tanzania. Furthermore, Daniel (2020) argues that elimination of fees in schools, creates issues of sustainability, equity and equality. Investing in education contributes to human capital development, which fosters economic growth through increased productivity, and contribute to decreases in social disparity (Kamau et al., 2015).

Other studies such as Hallinger (2003) examined the capacity of the heads of schools to apply resources available in schools. The study found that most of the heads of schools in primary schools lacked the capability to utilize effectively the resources available in schools so as to implement FFEP in their schools. On the other hand, Godda (2018) conducted a study on the management capacity of heads of public secondary schools in the implementation of FFEP in Singida municipality. The study was descriptive research survey that employed both qualitative and quantitative research approaches. The findings indicated that heads of public secondary schools possessed managerial skills to run their schools effectively despite being faced with several challenges, like inadequate funds to cater for the schools' needs, a misconception by parents that the policy catered for all the fees, and a rapid increase in students' enrolment. The findings further revealed that school heads used informal and formal coping strategies like community participation and informal peer coaching to manage the challenges of FFEP.

In a study by Nigicser (2017), in Niger, the study attempted to focus on teachers' abilities in utilizing physical resources to implement FFEP. The study employed questionnaires as a tool of data collection. The study found that head teachers do not have enough ability to utilize resources available in schools to implement FFEP. Alam and Ahmad (2017) carried out a study based on the ability of heads of schools to implement gaps in educational policies in Pakistan. The study used secondary data as the documentary review. The study found that the absence of coherence

progressive government arrangements and the training of heads of schools to effectively implement education policy are the major challenges that face heads of schools in Pakistan. The study suggested that the government should provide education to heads of schools on how to effectively implement FFEP to provide quality education.

Victor (2017) analysed principals' managerial competencies for effective management of school resources in secondary schools in Anambra State. The study discovered that school principals have managerial competencies such as prioritizing financial allocation based on school needs, maintaining accurate financial information, ensuring accountability in all school expenditures, conducting periodic audits of school budgets, and implementing cost-cutting strategies for effective financial resource management, among other things.

Orodho (2014) evaluated East African policies on fee free primary and secondary education. The data reveals that access to primary and secondary education in the East African countries has increased dramatically. However, education in these countries has been met with virtually identical unique obstacles in providing education, resulting in significant regional and gender gaps in access to, and low quality of education.

Mohammedi et al. (2015), conducted a study to determine the challenges of implementing fee free secondary education in secondary schools in Mandera West Sub-County in Kenya. The policy was found to be falling short of its laudable goals of increasing access to and quality education. It was suggested that the Kenyan government, through the Ministry of Education, enhance capitation and speed up the fund transfer process to schools.

From the reviewed studies it has been revealed that most of the studies' focus was on other resources other than fiscal resources. This study specifically covered that knowledge gap by investigating the abilities of heads of schools in utilizing the fiscal resources for implementing FFEP particularly in community secondary schools. Furthermore, despite all the management and supervision inefficiencies reported in secondary schools in Tanzania, there are no clear strategies stipulated in the new education policy of 2014 to improve management and supervision of financial resources to enhance FFEP in secondary schools. The reviewed literatures

were useful to find out the studies conducted in the area of FFEP and to establish the reason of the current study. It is, therefore, in this context that the study had the major objective of investigating the capacity of heads of schools to utilize the fiscal resources for implementing FFEP in selected community secondary schools in Tarime district.

The study's theoretical foundations are built on a theory, namely the system theory that was established by Ludwig Von Bertalanffy (Von Bertalanffy, 1950). A system, according to Hall and Fagen (2017), is a collection of items or entities that interact to produce a whole. The system theory sees social organizations, such as schools, as systems made up of individuals who interact as they work together in different structures, depending on each other. This, system theory provides framework to understand the importance of different structures at the school level, such as the school committee/board, the heads of schools, teachers, and parents as well as at higher levels, such as the community, district, region and the nation in providing input on the school's management. This approach is based on the idea that organizations (schools) do not exist in a vacuum, but are reliant on their internal surroundings, such as teachers, students and parents; and external surroundings, such as the society or economic system to which it belongs (Von Bertalanffy, 1950). Different actors at different levels within and outside the school impact on heads of school decisions, thus, without the support from within and outside the school system, the capacity of the heads of schools to utilize resources becomes questionable.

METHODOLOGIES

Research Design, Sample, and Sampling Techniques

The study employed descriptive research design with a quantitative approach where stratified sampling technique was used to select a sample size of 190 respondents. The stratified sampling technique allowed the researcher to group the population into small groups called "strata" and then the sample size was selected from the small groups by using simple random sampling technique (Kothari, 2019). This method gave equal chance of all the members of the population to be included in the sample size. The researcher decided to use this method so as to provide equal chance to all teachers to be included in the study regardless of their gender.

Data Collection Methods

The study comprised of both primary and secondary data, whereby questionnaires were used as primary data collection tools and documentary review was used as a secondary data collection tool. The 190 questionnaires with Likert scale questions were administered straight to the teachers of the selected secondary schools. Likert Rating Scale was selected because it made possible to cover all aspects of the study. For all the sub-parts and sub-sections, the selected respondents were asked to put a tick **(**√) response corresponding to their choices. The Likert scale instrument was employed by the researcher because it reduces bias and it helps to collect information in a very short time within a group of people (Etikan & Bala, 2017). The instrument makes easy and flexible interpretation of quantitative data where a range of opinions, behaviours and attitudes can be easily interpreted because Likert scale surveys provide a wider range of answer options. Data were coded, entered and analyzed through descriptive statistics which was also used to summarize the information collected in the study. Results were presented in tables and figures based on frequencies and percentages and in consideration with the major objective of this study.

FINDINGS AND DISCUSSION

Demographic Information of the Respondents

Table 1 presents the information of the study respondents.

Table 1: Demographic Information of the Respondents (N=190)

Variable	Frequency	Percentages (%)
Gender		
Male	97	51
Female	93	49
Total	**190**	**100**
Educational level		
Diploma	8	4
Degree	171	90
Masters	11	6
Total	**190**	**100**
Age		
Below 30 years	71	37
30-40 years	83	44
Above 40 years	36	19
Total	**190**	**100**

Source: Field Data (2021)

Table number 1 shows the number of respondents. Demographic data are potentially useful for providing attention to any features that might be linked to the substantive topic and therefore keeping a good record of the participants' relevant characteristics. It is crucial to know the characteristics of the respondents hence easy to ascertain if the sample is a representative of the population or not. The demographic data show that the selection included different genders, age groups and education level so in a way representative (Maslovskaya, 2019). The number of male respondents' participation in the study was 97 (51%) and female were 93 (49%). This implies that both males and females participated in the study. Also, the category of education level indicated that 171 (90%) of respondents had bachelor degree level, 8 (4%) of respondents had diploma level, and 11 (6%) of respondents had master's degree level. This implies that a large number of respondents with a degree level participated in the study.

Moreover, table 1 indicates respondents' age where 83 (44%) of respondents were between 30-40 years old, while 71 (37%) of respondents were below 30 years old and 36 (19%) of respondents were above 40 years old. This indicated that respondents with ages between 30-40 years old were more than other age groups of the respondents who participated in this study. The data implied that all age categories were represented in this study.

Capacity of Heads of Schools in Utilizing the Fiscal Resources

Table 2 indicates the summary of the findings as far as the objective of the study is concerned. The table summarizes the capacity of heads of schools in utilizing the fiscal resources for implementing FFEP using various selected aspects. The Likert scale was used to summarise the findings as it allows respondents to self-report the extent of their agreement or disagreement with given questions. The likert scale also enables easy and quicker data analysis.

Table 2: The Capacity of Heads of Schools in Utilizing the Fiscal Resources (N=190)

Statement	Strongly Agree	Agree	Neutral	Disagree	Strongly Disagree	Total
Heads of schools do not supervise and monitor the expenditure of school funds per government directives and financial regulation	17%	19%	-	37%	27%	100%
Head of schools do not prioritize financial allocation according to needs in schools	15.2%	16.3%	-	43.3%	25.2%	100%
Heads of schools do not ensure that school budgets reflect agreed goals and objectives	22%	48%	-	15%	15%	100%
Heads of schools do not delegate the mechanisms of financial matters to capable staff members	33.6%	34.7%	-	12.8%	18.9%	100%
Heads of schools do not keep financial records	11.8%	21.5%	-	31%	35.7%	100%
Heads of schools do not use the school budget for decision making	12%	18%	-	48%	22%	100%

Source: Field Data (2021)

The findings of aspect number one in table 2 indicate that the highest percent (37%) of the respondents disagreed while the lowest percent (17%) of the respondents strongly agreed that heads of schools do not supervise and monitor expenditure of school funds per government directives and financial regulations. These findings reveal that heads of schools supervise and monitor the expenditure of school funds per government directives and financial regulations.

Based on the findings, it is clear that it is not true that the heads of schools do not supervise and monitor the expenditure of school funds per government directives and financial regulations, but that they do supervise and monitor the expenditure of school funds per government directives and financial regulations. The possible reasons that enhance the school heads to supervise and monitor the funds properly are due to prior training that was conducted during the commencement of FFEP. The findings are different from those of Victor (2017), who showed that although management agencies perform well in certain areas, they face many challenges in monitoring and controlling budgets. The study found various challenges in budget preparation, execution, and budget control in the budget preparation process. Various challenges were identified that affect the budget control and control process including poor financial reporting, insufficient and weak public training for school administrators.

Moreover, studies such as Mkanga (2016) have shown that leadership power is crucial in schools' implementation of education reforms.

Furthermore, findings in table 2 show that the highest number of respondents (43.3%) disagreed, and the lowest number (15.2%) of respondents strongly agreed that heads of schools do not prioritize financial allocation according to needs. This shows that it is not true that heads of schools do not prioritize financial allocation according to needs. Therefore, the findings indicated that the notion that the heads of schools do not prioritize financial allocation according to needs is not true, but the fact is that the heads of schools prioritized all financial allocation according to needs within the school.

The findings imply that the decision on which budget to use and how to allocate depends on the method that best suits the school's circumstances. Different techniques are used in budgeting, and it's important to understand each technique in order to allow the school to choose the most appropriate budget method to prioritize financial allocation according to needs. These findings are supported by Victor (2017) who found out that school principals have managerial competencies in prioritizing financial allocation according to school needs, keeping accurate financial information of the school, ensuring accountability in all school expenditures, carrying out periodic auditing of school budgets and adopting cost-saving strategies for effective financial resource management among others. However, the findings are different from the study by Nigicser (2017) in Niger, which attempted to focus on teachers' abilities to utilize financial resources and found that head teachers do not have enough ability in utilizing the resources available in schools to implement FFEP.

Moreover, the findings in table 2 show that the highest number of respondents which is 48% agreed, while 15% of the respondents (the lowest number) strongly disagreed that heads of schools do not ensure that school budgets reflect agreed goals and objectives. The possible reasons of the findings might be caused by various factors that face the heads of schools in secondary schools in Tarime district such as misuse of financial resources, insufficient financial planning skills, and poor budget allocation. A good budget can reduce the risk of financial crises. It can also save a lot of time and stress associated with sudden financial shortages. A good budget can also lead to better educational results while

giving schools more leeway to respond to curriculum changes and allocate resources where they are most needed. However, Aluko and Adan (2015) recognized that poor planning and limited enhancement of school heads' capacity to manage the programs negatively influenced the achievement of desired goals of fee free secondary education in Kenya. This incapacity limited the possible level of success of the program. The disharmony between the heads of schools and other school organs also has led to the haphazard and unsystematic implementation of school projects or utilization of the school funds sent by the FFEP for that matter.

On the other hand, findings in table 2 show 34.7% of the respondents agreed. 33.6% of the respondents strongly agreed, while 18.9% of the respondents strongly disagreed, and 12.8% of the respondents disagreed that heads of schools do not delegate the mechanism of financial matters to capable staff. These findings indicate that heads of schools do not delegate the mechanism of financial matters to capable staff. The findings imply that limited enhancement of other capable staff in managing the program negatively influenced the achievement of the desired goals of FFEP. This incapacity limited the possible level of successes of the program. The disharmony between the heads of schools and other school organ also has led to haphazard and unsystematic implementation of school projects or utilization of the school funds send for the implementation of the policy.

Also, the findings in table 2 show that 35.7% of the respondents disagreed, 31% of the respondents strongly disagreed, while 21.5% of the respondents agreed, and 11.8% of the respondents strongly agreed that heads of schools do not keep financial records. This indicates clearly that heads of schools do keep properly financial records. Additionally, the findings showed that majority of the respondents revealed that it is not true that heads of schools do not keep financial records, but the fact is that heads of schools tend to keep financial records properly. The findings are supported by Victor (2017), who analyzed principals' managerial competencies for effective management of school resources in secondary schools in Anambra State. The study found out that school principals' have managerial competencies in prioritizing financial allocation according to school needs, keeping accurate financial information about the school, ensuring accountability in all school expenditures, carrying

out periodic auditing of school budgets, and adopting cost-saving strategies for effective financial resource management, among others.

In addition, the findings in table 2 show that the highest number of respondents (48%) disagreed, while the lowest number (12%) of the respondents strongly agreed that the heads of school do not use the school budget for decision making purposes. The findings revealed that it is true that the heads of schools do not use schools' budgets for decision-making because majority of the respondents indicated that the heads of schools do not use schools' budgets for decision-making. This implies that heads of schools have the capability of planning and allocating financial resources for implementing FFEP in Tarime Urban District. The ability to plan and allocate financial resources is very crucial as, since ancient times, the budget has been a very important and useful part of the management strategy for educational institutions. Controlling the financial behaviour of school system officials is essential. The budget can prevent the funds provided for various educational services from being wasted or spent recklessly. The reason is that budget operators are obliged to use appropriate discretion when spending money.

These findings are different from those of Hallinger (2003), who found that most of the heads of schools in primary level education lack the capability to utilize effectively the resources available in schools so as to implement FFEP in primary schools. However, the findings are supported by Penlington et al. (2018) who found that headteachers did not act alone to ensure the school was successful, but they played a great role in involving other stakeholders to ensure a school was achieving its goal.

CONCLUSION

Based on the findings, the study concludes that various related literatures have shown similar and or different findings as compared to this study. This study for instance has found that the heads of schools do supervise and monitor the expenditure of school funds as per government directives and financial regulations. This is contrary to other studies that was conducted before which indicated that heads of schools do not supervise and monitor the expenditure of school funds as per government directives and financial regulations. In addition, the study found that heads of schools do not have the capacity to utilize resources for the successful implementation of FFEP in community secondary schools. Therefore, this study concludes that heads of schools are supposed to give true financial

information about their schools as well as to keep records of staff properly and accurately in planning and allocation of funds for implementing FFEP. The study further concludes that the prioritization of financial allocation according to needs in some of the secondary schools in Tarime Urban District helped successful implementation of FFEP in the community secondary schools.

RECOMMENDATIONS

First, the study recommends that heads of schools should ensure that the school budgets reflect agreed goals and objectives as per plans for successful implementation of FFEP in community secondary schools in Tanzania.

Second, the study recommends that heads of schools need to delegate the mechanism of financial matters to capable staff. This goes together with the head of schools to give accurate financial information about their schools.

Third, this study recommends that heads of schools should keep records of staff properly and accurately in planning and allocation of fiscal resources for implementing FFEP and should also involve staff in decision-making and matters concerning school budget.

Fourth, the study recommends that government and educational stakeholders should allocate adequate budget to be released to community secondary schools for smooth implementation of FFEP in schools.

The study further recommends other studies to be conducted in the area of FFEP considering the aspects that have not been taken on board in other studies.

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