VISION IMPROVEMENT THROUGH STIMULATION IN PRIMARY SCHOOL STUDENTS, ARUSHA-TANZANIA

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A DISSERTATION SUBMITTED IN PARTIAL FULFILMENT OF THE REQUIREMENTS FOR THE DEGREE OF MASTER OF EDUCATION IN ADMINISTRATION, PLANNING AND POLICY STUDIES

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CERTIFICATION

The undersigned certifies that she has read and hereby recommends for acceptance by the Open University of Tanzania a dissertation titled: "**Vision Improvement Through Stimulation in Primary School Students, Arusha-Tanzania",** in partial fulfillment of the degree of Masters of Education in Administration, Planning and Policy Studies (MED-APPS) of the Open University of Tanzania.

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Dr. Hyasinta Kessy

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Date

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DECLARATION

I, **Alida Sebastian Kauki**, do hereby declares that this dissertation is my own original work and that it has not been submitted and will not be presented to any other university for similar or any degree award.

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Date

DEDICATION

I dedicate this work to all those who are professionals, practitioners and learners in the field of Education.

Most importantly, I wish to thank my loving and wonderful children, Blessings and Princess Myra who despite being very young, they were patient when I was busy with this study.

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ABSTRACT

The main objective of this study was to assess vision improvement through stimulation in primary school students in Arusha. The study was guided by three specific objectives including: Examine student's vision functions in reading and learning, finding vision problems that may hinder some students in learning, and finding out Students, Parents, and Teachers awareness on vision disturbances. The study employed descriptive survey research design with Quasi-experiment under a mixed method research approach. Data were collected through vision screening tests (pre and post screening) vision intervention lessons, focus group discussion, interviews and questionnaires. Case by case analysis was done through simple statistical analysis with Measures of the central tendency (means) and disparity (standard deviation). However, descriptive analysis was also done to get an overview understanding of the students, parents and teachers understanding of vision disturbance. Findings revealed that, the four cases represented various issues of visual challenges before intervention all reached a better functional level following improved vision after vision stimulation. The study also revealed that students, parents and teachers have poor understanding of vision disturbances. From this study therefore, the most significant finding is that vision can be improved through stimulation. This study strongly recommends on the government and the policy makers to plan for vision screening and examinations for children prior to their enrollment to enable early intervention.

Keywords: Vision, Vision disturbances, Vision Stimulation

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LIST OF ABBREVIATIONS AND ACRONYMS

AMA	American Medical Association
AOA	American Optometrician Association
BSI	British Standard Institution
ICD	International Classification of Diseases
OECD	Organization for Economic Co-operation and Development
OED	Oxford English Dictionary
VI	Visual Impairment
VA	Visual Acuity
WHO	World Health Organization

CHAPTERONE

BACKGROUND AND STATEMENT OF THE PROBLEM

1.1 Introduction

This chapter presents the background to the study, the statement of the problem, the overall purpose of study, specific objectives, as well as the study questions. It also presents the significance, scope, delimitation and limitation of the study. The chapter also integrate the definitions of some key terms so that when they are mentioned in the text the reader can easily follow through.

1.2 Background of the Problem

The process of learning involves various senses including eyes, ears, tongue, skin and nose. Reading using eyes is essential in all learning, and this is to a large degree a visual activity. In Tanzanian primary school where pupils lack enough textbooks and are educated in overcrowded classrooms where the chalkboard is the dominant pedagogical medium, good and quality vision is very important. Teaching in these classrooms normally takes place by the students copying what the teachers write on the chalkboard.

Vision is therefore a critical factor in the learning processes. Various researchers (McAlister, Garzia & Nicholson, 2000; Smith, *et al*., 2000; Belfiore et al., 2004; Elbaum & Vaughn, 2005; Nowicki, 2003; Kauffman& Trent, 2004; Lane, 2005) argue that if learners experience vision disturbances, their learning process become ineffective.

Visual challenges may include double vision (diplopia), moving (blurred) vision due to nystagmus which is involuntary rapid movements of the eyes, reduced visual acuity, reduced visual field, poor accommodation and convergence, misaligned eyes and partial or total loss of vision (Piquette & Boulet, 2012). This might have negative impact to a child's total learning development and perhaps the entire life.

Also, pupils with vision disturbances often have problems following the education and are often mistakenly seen as hyperactive, passive or having dyslexia. Consequently, they are more prone to dropping out of school than pupils with good vision. In most cases students sitting in a classroom taking notes from a blackboard or copying from an exercise book find themselves struggling a focusing problem, that don't allow them to change their focus effectively from near to far and back again quickly enough to keep up with the learning processes argues (Datta, 2013; Al-Majali & AL-Thneibat, 2013).

Different studies have identified that approximated 15 to 25 % of American/European students have vision problems that may cause reading and learning difficulties (Heim, 2004; Plotsky & Nemeroff, 2000; Sterner *et al.*, 2004; The Centre for Health and Health Care in Schools, 2004; Wilhelmsen, 2012). This shows the importance of teachers to have vision competence so that they can accommodate and take measures in early identifying and intervention of students with vision problems. Reading is a higher cognitive process depending on multiple processes including sensory perception, eye movements, linguistic and semantic capacities argues (Rayner *et al.*, 2011). Thus, a good control of the ocular motor system, in particular saccades,

convergence and fixations, is essential for reading (Levy-Schoen & O'Regan, 1979; Seassau & Bucci, 2013).

Teachers need to have vision competence so that, in case a child has such vision problems they can easily identify and accommodate them through vision lessons and other appropriate adjustments. Deficits in one or more of these mechanisms could be at the origin of struggling in reading and learning among most learners in classrooms especially in most Tanzanian schools, which are crowded. Thus it is very important to early identify vision problems so that early intervention can be done. Research further argue that even tiny vision disturbances including (sensor, motoric and perceptual functions) are known to, interrupt student's reading and learning and affect the student's abilities in comprehension and work in the class (Al-Majali & AL-Thneibat, 2013).

In addition to the visual acuity of each individual eye, there are a number of visual skills, which are features of binocular vision, which is the two eyes' ability to work together or the ability to maintain the visual focus on an object with both eyes so as to create a single visual image. In normal vision, both eyes are accurately aligned on a fixated object, so the images from that object fall on the fovea of each eye. Either, the specific image orientation on corresponding retinal areas of each eye allows cortical processing, which results in the merging or fusion of the two images (Levy-Schoen & O'Regan, 1979; Seassau & Bucci, 2013).

Richman (2006) further noted that, the visual system relies on a complex twosome between the two eyes, which must be perfectly tuned to a range of sensory and motor

functions. When this system is not working properly, visual deficits can develop. This can therefore result into complications in child's reading and learning.

Gallaway & Mitchel (2010) further assert that, many other visual skills are indispensable for reading as well as in other classroom and home activities. For example, to follow the text along the lines, the eyes must perform tracking and coordinate their movement perfectly. To focus for the entire attention both eyes have to fixate on the same spot thus a child relies on convergence, which is the ability for the eyes to come together and lock inwards on the same target. This is a hard work of muscle coordination whereby**;** when these muscles are weak they cannot work together easily**.** Eye movement in reading involves the visual processing of written text. In this work, eyes make short and rapid jumps to new words in the text. This process is known as saccades combined with short stops, fixations.

Finally, to look back and forth from the page to the board requires an effective accommodation, changes in the lens shape for seeing clearly on different distances (Glasser & Kaufman, 2003). This is a reaction permit altering the lens shape, so it is likely to see visibly at a remote and then at close by. All these activities have to function together and are more challenging at near than at far distance **(**Belliveau *et al*., 2020; Cernea et *al*,. 2004; Pamplona et al,. 2009).

Generally, a pedagogical understanding of visual strategies in learning is globally a neglected phenomenon. Teachers and educational specialists are in the need of insight into how information must be visually presented and the importance of improving teaching methods.

1.3 A Statement of the Research Problem

Various studies (Mariotti & Pascolini, 2011; WHO, 2014; 2018; 2019;Congdon et al., 2014; Vishal et al., 2014; Parab et al., 2012; Ramani et al., 2013; Orihoela et al., 2016) found out that, an estimated 19 million children are blind or visually impaired globally with the majority of vision impairment being preventable or treatable. The highest burden of blindness is experienced by children in low-income countries Tanzania being one of them, where the prevalence is estimated to be 0.9 per 1000 children compared with 0.7 per 1000 and 0.4 per 1000 children in middle- and high-income countries respectively due to fewer eye services thus increased barriers to accessing eye services in low-income countries (WHO; 2014; 2019; Lester, 2007). Although the general understanding to previous studies confirms visual impairment could be treatable, yet little is known about *Vision Improvement through Stimulation*.

1.4 Purpose of the Study

The main reason of this study was to assess Vision Improvements through Stimulation using structured vision lessons with standard seven students in Arusha, Tanzania.

1.4.1 Specific Objectives

Specifically, the study anticipated to:

(i) Examine student's Vision functions through screening tests

(ii) Find the vision problems hindering some students' learning

(iii) Examine students, parents and teachers' awareness on vision disturbances of students

1.4.2 Research Questions

This study was guided the following research questions.

(ii) How does student's vision function?

(iii) What are vision problems hindering students learning?

(iv) To what extent are students, parents and teachers aware of vision disturbances of students?

1.5 Significance of the Study

This study is very important in ten following ways:

(i) It will give teachers insights in visual functions of the children so they can assist them accordingly.

(ii) It will also help teachers in understanding how various vision problems can hinder learner’s learning progress and how to go about it.

(iii) The study will further give teachers new methods of assessing and identifying vision disturbances to learners for their academic achievements.

(iv) The results from this study will give great insights to Educational stakeholders including teachers, educational policy planners, and the community at large on the importance of Vision Screening and early intervention to learners.

(v) The study will also provide teachers and educational specialists understanding into how information must be visually presented and the importance of improving teaching methods.

(vi) The findings add to the body of knowledge of literature on vision improvement through stimulation using structured vision lessons.

1.6 Scope of the Study

Learners experiencing vision disturbances are not limited to few schools. In every regular school there are some students experiencing vision disturbances and in most cases they are labeled to be slow learners when they did not manage to perform as their peers. However, due to limitation in time, this research is delimited to assess vision improvement through stimulation only in one primary school. Although data were obtained from a small sample of students and its unity of study, previous studies and research have identified that 15 to 25 % of many students have vision disturbances that may cause reading and learning difficulties and that students with visual problems affecting their learning and development both attained a better visual functional level, as well as better reading, following better vision after the educational interventions through vision lessons (Wilhelmsen *et al.,* 2015; Wilhelmsen 2012; Wilhelmsen *et al.,* 2018). Based on these references, this study therefore assumed that, in all classrooms in the world some children are struggling with blurry letters, double images or no vision capacity for reading the text on the chalkboard. This can help in generalization of data from this study.

1.7 Limitations of the Study

The study encountered some challenges including the following ones;

(i) One of the problems was associated with the outbreak of COVD-19 Pandemic, schools had to be closed. This was beyond researchers ability so she have to wait for the school re opening

(ii) Time constraint was another challenge the researcher faced because on re-opening, schools had a tight schedule to meet deadlines bearing in mind that the

participants were in preparation for their leaving examination. Hence the researcher had a very limited time in collecting data. To accomplish this study timely, extra time including weekends and break time had to be used to obtain accurate data.

(iii) Another challenge was association with fund constraints for buying some tools and equipments for vision screening and vision intervention as well. To overcome this challenge the researcher has to use her money.

1.8 Definition of Key Concepts

This part provides discussion of key concepts for the purposes of mutual understanding. Among important key concepts discussed, these are briefly discussed below:

1.8.1 Vision

Refers to the ability of be familiar with bits and pieces through the eyes after processing the information to the brain.

1.8.2 Visual System

The visual system includes the eyes, the optic nerves, and pathways to and between different structures in the brain.

1.8.3 Visual Functions

Vision is composed of many corresponding functions, which portray the way eyes function. Visual functions include the capability of the eye to be aware of small details clearly, the capacity of the eye to see total area in which items can be seen

in the side (peripheral) vision when an individual focus his or her eyes on a central point, the ability to make discriminations, the ability to differentiate the foreground from the environment and the capability of the eye to recognize depth.

1.8.4 Functional Vision

Functional vision refers to individual's abilities concerning the use of whatever vision one has in the Activities of Daily Living such as reading ability, orientation and mobility and the like.

1.8.5 Visual Acuity

Vision acuity is the clarity of vision. It refers to the measure of how clearly one can see the tiny details.

1.8.6 Accommodation

Accommodation is the process by which the eye modifies its visual power so as to clearly see the object clearly. Through this ability the eye can convert its focus from looking clearly at a distant object and change for clear viewing of a near objects, and vice versa.

1.8.7 Fixation

Fixation is the capability of the eyes to pose their movement to interpret the visual information. This happens when the eyes are focussed straight on an item.

1.8.8 Eye Movements

Is the ability of the eyes to turn around in parallel, crossways and perpendicular directions?

1.8.9 Visual Stimulation

Is the practice of exercising the eyes with the aim of overcoming vision disorders, in particular those relating to binocular function (i.e. vision difficulties stemming from the misalignment of the eyes). Unlike eyeglasses and contact lenses, which simply compensate for vision problems, or eye surgery that alters the anatomy of the eye or surrounding muscles, vision training aims to teach and strengthen the visual system to correct itself.

1.9 Organization of the Study

This study is organized into five chapters namely; chapter one, chapter two, chapter three, chapter four and finally chapter five.

Chapter one: presents the background to the study, the statement of the problem, the overall purpose of study, specific objectives, as well as the study questions. It also presents the significance, scope, delimitation and limitation of the study. The chapter also integrate the definitions of some key terms.

Chapter two: which provide an overview of the theoretical frameworks used in the study, the related literature as per objectives and the research gap to be filled in.

Chapter three: presents and discusses the research design and methods employed in data collection to meet the specific research objective of the study. The chapter is organized in several sections including the first section that elaborate study context where the justification for the study context is presented. Section two describes the approach used in the study, section three presents the research design employed, while

section four and five constitute the target population, the sample and sampling techniques involved. Finally, pilot testing, validity and reliability of instruments, ethical considerations taken, and data analysis procedures are highlighted in the last sections of this chapter.

Chapter four involve the presentation, analysis and discussion of the major findings of the study in line with the study objectives stated in chapter one. The findings are presented into three main sections as per objectives stated in chapter one.

Chapter five concludes the study report with a presentation of a research summary, conclusions and recommendations. Recommendations are provided for policy, action and future research.

CHAPTER TWO

LITERATURE REVIEW

2.1 Introduction

This chapter provides firstly, an overview of the theoretical frameworks used in this study. Secondly, it discusses the related literature to the study as per objectives and finally the chapter concludes with a statement indicating what remains to be studied.

2.2 Theoretical Analysis

This study was informed by two theories namely, *Information Processing Theory* and *Visual Information Processing Theory*.

2.2.1 Information Processing Theory

The information processing theory operates under cognitive learning theory (Branford, 1979). The basic idea of this theory is that the human mind is like an information processor that receives inputs, processes, and delivers outputs. The theory relates to study in the sense that reading does not occur only in the vision but also requires cognitive mechanism based on motor activity (Dequiros, 1979).

Information gathered from the senses, like vision scanning, is transferred to the brain and then interpreted, and finally brings about a behavioral response. In this theory, reading and learning occurs by associate vision functions. There is so much more to child's vision than being able to see small letters on a chart at the other side of the room.

Lane (2012) argued that the visual area in the brain known as the occipital lobe is stimulated and developed through different visual inputs from the central and peripheral visual system.

The sequencing, translating and understanding skills necessary to read provide basics for learning and reading involves sequential and corresponding steps of visual processing, sensor motor coordination, cognitive and linguistic processing (Garzia, 1996). Lane (2005) further note that one of the most important parts of reading is moving the eyes across the page of print.

If these eye movements are disturbed, reading problems will likely occur. Therefore, it should be necessary for pupils to reach a good level of precise eye movements. This will help an individual to be able to encode visual information for better reading and leaning.

Either, Information Processing Theory plays a significant role in how the learner receives incoming stimuli through five senses. Schunk (2000) argued that the information processing model is triggered through stimuli inputs, including one or more of the human body's senses such as sight, smell, taste hearing and touch.

Sprenger (2003) found out that when major sense such as sight needed to send information to a learner's brain, they are forced to rely on the remaining four senses to absorb information in their sensory memory. Sprenger (2007) also found out that for students who are prone to be more visual in their dominant method of learning, a strong visual stimulus is vital. Receiving visual stimuli that are inaccurate forces the

learners suffering from vision related learning problem to receive inaccurate information as well as attempt to combine in accurate information with related knowledge and store in their memories. In this case therefore, Quality Vision is very important in the academic achievements of learners.

2.2.2 Visual Information Processing Theory

Visual information processing is defined as a group of visual cognitive skills used for extracting and organizing visual inputs, from the surroundings and incorporate these inputs with other sensory modalities and higher cognitive functions (Scheiman, 2011). It is the capability to understand what is seen which is the action directed by the eyes. In Trachtman's earlier research of visual information processing, he explained that there are four models of processing.

These are including parallel processing, alternating processing, central processing and peripheral processing (Trachtman, 2000). Trachtman further note that parallel processing is the most affective type for successful reading and learning. Scheiman (2011) later asserted that peripheral processing is necessary for the development of good visual spatial skills and draws parallel conclusions on the role that it plays in the ability for student to successfully read and write (Goldstand, 2005). Studies including those of (Norman, 2002; Palmery, 2004; Treue, 2003) further found that visual information processing skills are associated to a student's capacity to study and achieve in a school setting as well as out of school settings. Here a sufficient visual information processing creates a consistent and comfortable atmosphere for the students with healthy visual systems.

Moreover, Visual information processing is the visual reasoning skill that enables individuals to process and understand sense from visual information that are acquired through vision. Visual awareness plays a very significant role in everyday life of any human being and other creatures as well (Zhao *et al.,* 2015; Fujita *et al.,* 2008; Chapman *et al.,* 1988; Almog, (2006) noted that excellent visual information processing means being able to rapidly and precisely process and examine what is being seen and accumulate it in the visual memory for later remembrance. This is important because it enables an individual to be able to make decisions on what suitable action is necessary to interrelate with the surroundings and situations to which an individual is exposed. For example, in the classroom when a student is reading and writing, it is imperative to be able to rapidly and precisely decipher, understand and keep in mind written materials at the same time and still being able to pay attention to the teacher. To do all these in precise way, a student will really needs good vision.

2.3 Empirical Literature Review

This part presented various review of literature related to Vision improvements through Eye Stimulation. This helped to provide an overview of sources that were explored in relation to this study and provided insight into ways in which the researcher has limited the scope to a needed area of inquiry.

2.3.1 Students' Vision Function

Good vision is directly related to learning. Research has revealed that 80% of what children gain knowledge of in school is through visual appearance and when they cannot see the text in a book or on the blackboard clearly, they struggle to reach their academic potential. Vision is an ever-changing process that is learned and directly

affects how children think, how they solve problems and even how they feel ((Fuchs *et al*,.2003; Ormrod, 2008; AOA 2004; Bates, 2010; Shandiz et *al.*, 2018; Seitz and Watanabe 2009; Jeon& Cha 2013). The way children see influences all their daily interactions with their families, friends and co-learners. The concern is with not just what they see, but how they see, and how efficiently they use their eyes (Learner& Kline, 2005; Lane, 2005). Studies also further agree that vision processing is a capability that occurs in the brain.

Good visual processing ability make it easier to comprehend, retain information and study at school (Chalupa & Werner, 2003; Norton, 2002; Lu & Dosher, 2013; Gegenfurtuner *et al.,* 2000; *Flanagan et al.,* 2006; Dawson & Guare, 2012; Huebner *et al.,* 2004).

Imagine sitting in a classroom taking notes either from the blackboard or from a book and at the same time fighting a focusing problem, that won't allow a child to change his or her focus from near to far and back again quickly enough to keep up with the teacher. This can be a very tiresome activity and can make a student easily exhausted in the learning process. For a child to learn successfully she/he must precisely understand what he/she sees thus quality and good vision is very important. As the child grows, its visual perceptual processing skills develop gradually as well. In this, the child must learn how to not only see the world but even comprehend the world that is around him by processing the information that is sent to the brain from the eyes (Castanes, 2002; Cook, 2004, Render *et al.,* 2005). Other studies (Smith et *al.,* 2006; Lane 2012; Adams & Horton, 2002; Bartolomeo *et al.,* 2001) also suggest that quality vision helps in learning, close work, and particularly reading and other visual skills.

Children must have a variety of inspecting, focusing, and eye harmonization skills for effective reading and learning. If these abilities have not developed well, reading and learning to students is demanding and complicated.

Studies (Goldstand *et al.,* 2005; Belfiore *et al.,* 2004; Learner & Kline, 2005, Lane, 2005) further assert that, when reading, many course of action need to function cooperatively. The eyes need to focus uniformly on the piece of paper and work together to avoid dual vision. In this, the eyes need to be able to shift swiftly and precisely from across the words and lines. The brain has to understand the descriptions it obtained to make common sense of what it observed.

Children's eyes are constantly in use in classroom activities and when they play. This is why the schooling and involvement in different activities can experience obstacles if vision is not performing appropriately (Ethan &Basch2008; Goldstand et *al.,* 2005). In fact, good vision and eye health is a precondition for social, educational and economic independence and success of individuals including students. It is very essential for the children to develop good visual skills so as to become proficient learners. Reduced capability in visual skills can become a poor base for construction of academic and life attainment for children (Marsha *et al.,* 2010; Lv *et al.,* 2016; Basch, 2011).

2.3.2 Vision Problems Hinder Learning Process

The significance of high-quality vision for reading and learning has been the subject of substantial study. Various research (Franceschini et al., 2012; Valdois *et al.,* 2004; Van der Leij *et al.,* 2013) have shown that good visual capabilities are valuable

for learning to read and to read with comprehension studies. Although a child may seem to have a normal Visual Acuity (20/20) or 1.0 she or he may have visual problems which affect the eyes focusing, accommodation, binocular teaming, convergence and vergence or the skills of moving the gaze precisely along a line of print with binocular saccades from one word to the next when reading (Solan *et al.*, 2001).

This can cause problems in reading and learning to children.In addition to this, accommodation and binocular vision problems like unstable convergence may also cause symptoms like headache, eyestrain, blurred vision, intermittent diplopia, poor concentration and comprehension when performing near tasks.

The prevalence of visual problems in primary and secondary schoolchildren (6–18 years) in many countries Tanzania included is unknown, but recent studies (Hagen et al., 2018; Heim *et al.*, 2004; Sterner *et al.*, 2004; The Centre for Health and Health Care in Schools, 2004; Wilhelmsen, 2018) found out that many children have vision problems.

Either, various research (Basch, 2011; Dudovitz *et al.*, 2016; Grisham et al., 2007; Ethan & Basch, 2008; Evans et al., 2018; Goldstand *et al.*, 2005) also show that, unnoticed vision challenges are a major cause of reduced performance in everyday life, academic achievement and self-esteem. If a child keeps away from activities such as reading and homework, there will be serious outcomes for learning and for academic development and social success (Meetz & Harmon, 2010; Dudovitz *et al.*, 2016; Flashman, 2012; Davidson, 2011). This means that good vision is more

significant than ever and that uncorrected vision problems should be recognized as early as possible.

Even problems like small refractive errors and accommodation or oculomotor control discrepancy can cause headache, attentiveness problems or poor coordination and may lead to unnecessary challenges in school. Consequently, Myopic children have trouble reading blackboard notes and other classroom presentation resources. Hyperopic children will have trouble reading or doing any kind of close work.

In addition, several types of eye disorders can lead to lasting visual impairment if not recognized and treated early eye doctors (Annette 2004; Timmereck 2002). There are few published studies describing the visual condition or degree of common vision problems in primary and secondary schoolchildren in many countries including Tanzania. Studies done on vision suggest that there are a number of visual problems that are not detected (Kumaran *et al.,* 2015; Read *et al.,* 2014; WHO, 2019; Goldst and *et al.,* 2005). Most children examined had normal functional vision and health eye and only a few children had reduced visual acuity.

However, of those attended eye examination, 83% were confirmed to be true referrals, indicating that the vision screening program identified vision problems previously not detected (WHO, 2019; Goldstand*et al.,* 2005; Kumaran *et al.,* 2015; Read *et al.,* 2014). This shows the extent of presence of undetected vision problems to many students. It is likely that a substantial portion of the children found to have vision problems in these studies would have remained undiagnosed in absence of the vision screening (Harmon, 2010; Evans *et al.,* 2018; Meetz & Harm, 2010; Harmon, 2010;

Bruce *et al.,* 2016; Shankar et al., 2007; Williams *et al.,* 2007; Goldstand *et al.,* 2005; Kumaran *et al.,* 2015; Read *et al.,* 2014).

Despite all vision problems that children may have, research still suggest that common vision problems are easy and cost-efficient to correct. This can be done through the use of structured vision lessons for vision stimulation (Hussaindeen *et al.,* 2018; Meetz & Harmon, 2010; Goldstand *et al.,* 2005; Franceschini *et al.,* 2013; Davidson, 2011; OECD, 2018).

However, vision screening and examinations should be taken as a very important aspect to be included in school health services so as to support learning, social interactions, future education, employment and socioeconomic benefits.

2.3.3 Students, Parents and Teachers Awareness of Vision Disturbances

Studies (Kulp *et al.,* 2016; Vilela *et al* 2015; Rouse et al 2009; Borsting *et al* 2003; Hussaindeen, 2018) further suggest that many children, parents and teachers are unaware of vision problems that may influence academic performance and quality of the child's life. Other studies on vision problems suggest that, children do not necessarily complain of symptoms if not asked specifically.

Good visual acuity is crucial for successful learning in school. It is therefore essential for parents and teachers to know the visual status of school going children. Unfortunately, children are not always able to tell when they can-not see clearly. There may be a problem in vision even if children apparently seem to have good eyesight. The child may have good vision in one eye and very poor vision in the other.

Such child continues to function well without realizing the problem. It is essential to detect such uni-ocular poor vision as early as possible so as to provide appropriate intervention including referrals for eyeglasses, contact lenses, or vision therapy to intervene vision problems.

2.4 Synthesis and Knowledge Gap

A number of research (WHO 2019; Bozzani, 2011; Blanchet, 2012; Fricke *et al.,* 2018; Bourne *et al.,* 2017; Gilbert *et al.,* 2008) found out that *unnoticed vision problems* is a significant cause of reduced academic achievement and performance in daily life and self-esteem of learners. This obtains little attention in many countries although most of these vision problems are easily correctable (Gilbert, 1995; Kalikavayi, 1997; Frick & Foster, 2018; Njuguna et *al.,* 2009; Wedner & Foster, 2000). Either, recent studies (Wilhelmsen, 2018, Wilhelmsen & Felder 2020) found out that in Tanzania as in many other countries there are many schoolchildren with correctable vision disturbances that effect reading and learning but most of these problems go unrecognized to most children The available literature confirms that despite prevailing vision disturbances to learners in schools visual stimulation can improve these children's vision. However, although the general understanding to previous studies confirms visual Stimulation to improve vision of children having vision disturbances, yet little is known about *Vision Improvement through Stimulation* and therefore this study focused to fill this gap of knowledge.

CHAPTER THREE

METHODOLOGY

3.1 Introduction

This chapter presents and discusses the research design and methods employed in data collection to meet the specific research objective of the study. The chapter is organized in several sections. The first section deals with the study context where the justification for the study context and the quantitative paradigm are presented. Section two describes the approach used in the study, section three presents the research design employed, while section four and five constitute the target population, the sample and sampling techniques involved. Finally, pilot testing, validity and reliability of instruments, ethical considerations taken, and data analysis procedures are highlighted in the last sections of this chapter.

3.2 Research Approach

This study employed a Mixed Research Approach. It a research Approach where a researcher incorporate methods of collecting or analyzing data from the quantitative and qualitative research approaches in a single research study (Creswell, *et al.,* 2018). In this study therefore both quantitative and qualitative strategies in data collection and analysis were used for the broad purposes of breadth and depth understanding and justification of the results.

3.3 Research Design

This study used Embedded Research Design with Quasi-Experiment where Vision functions were pre tested followed by vision stimulation and then post tested. Areas,

which were tested and stimulated included Visual Acuity (Monocular and binocular) Near (40cm), and distance (3m), Accommodation convergence, Eye movements (Pursuit movement in all directions) and Binocular vision (Cover test: near & distance).

3.4 Study Context

The study was conducted at Arusha Meru Primary School particularly in Arusha Municipality, Arusha region. The list of resourced schools was obtained from the Regional Education Officer in Arusha. The selection of the school was based on the fact that it qualified for the principles of experimental studies as stipulated by Leary (2012). Arusha Primary School was chosen among the schools because it had extra qualities compared to the rest because the school had enough resources including a dispensary with appropriate rooms which were very useful for carrying out Eye screening tests and Vision stimulation activities. The Nurse and the Doctor at this school were also very helpful in the process. Furthermore, the school dispensary environment was calm enough to eliminate any uncomfortable situations such as noise that could affect the experimental results.

Arusha Region is one of Tanzania's 31 administrative regions. Its capital and largest city is the city of Arusha. The region is bordered by Kajiado County and Narok County in Kenya to the north, the Kilimanjaro Region to the east, Manyara and Singida regions to the south, and Mara and Simiyu regions to the west.

Major towns include Monduli, Namanga, Longido, and Loliondo to the north, Mto wa Mbu and Karatu to the west, and Usa River to the East. Latitude and longitude

coordinates are: -3.386925S, 36.682995E**.** Administratively, Arusha has seven districts, namely, Arusha City, Arusha Rural District, Karatu, Longodo, Monduli, Meru and Ngororngoro

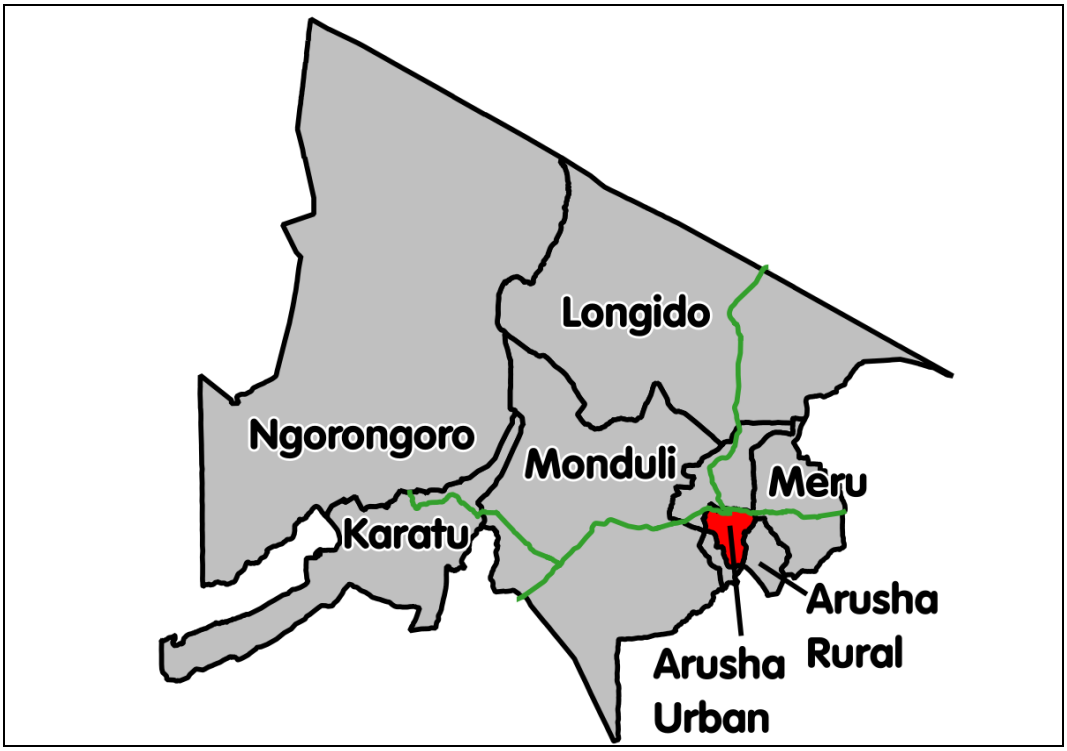

Figure 3.1: Location of the Study School in Arusha

Source: URT (2012)

3.5 Targeted Population

The target population of this study consisted of all 45 pupils at Arusha Meru Primary School, all 45 parents of standard seven students, and 50 teachers in Arusha Primary school. Thus the Targeted population for this study included 140 respondents.

3.6 Sample and Sampling Techniques

3.6.1 Sample

Due to the large sizes of populations, researchers often cannot test every individual in the population because it is too expensive and time-consuming. Therefore this study

comprised of total of 18 samples. Specifically the sample involved of 4 pupils, 4 parents and 10 teachers. The experiment needed enough time for pre screening, intervention for 45 minutes for each pupil for 21 days and then post screening so as to have appropriate data. Pupils were involved in the study because of the vision functions examined to them and the vision problems they have. They provided data on the vision disturbances and the vision improvements after stimulation.

Pupils also provided data on the awareness they have about vision disturbances. Parents were involved in this study because it was important to collect information on their understanding of vision disturbances. They provided data on parents' awareness of vision disturbances to their children. Either, teachers were involved in this study because it was important for their understanding of vision disturbances to pupils so that they can easily detect them and take appropriate measures. They provided data on the awareness of teachers of vision disturbances to pupils. The summary of the sample used in this study have been presented in Table 3.1.

Table 3.1: Sample Size of the Study

Students	**Parents**	**Teachers**
Female 2	Female 2	Female 6
Male 2	Male 2	Male 4
Total 4	**4**	**10**

3.6.2 Sampling Techniques

Three sampling techniques were employed in selecting respondents for this study. The techniques involved stratified, purposive and simple random sampling. These techniques were used as follows:

Selection of pupils: Pupils were selected through stratified sampling technique. In this, two groups, girls and boys were used to obtain the sample size whereby students from both groups were arranged alphabetically; shouted number 1, 2, 3, and 4 then students in groups of four were again instructed to shout 1, 2, 3 and 4 until they remained only four students in boys group and that of girls group.

Finally, girls and boys who shouted “one” and “three" were picked up and also the boys who shouted one" and "three" were also picked for sample. This sampling technique enabled the researcher to obtain a sample population that best represents the entire population being studied making sure that each subgroup of interest is represented.

Selection of parents: Parents were selected through purposeful sampling techniques. In this the researcher directly selected 4 parents of the pupils selected as sample for this study. This is because the researchers believed that by interviewing these parents, insights into other similar cases will be revealed.

Selection of teachers: Teachers in this study were selected trough simple random sampling technique. Simple **r**andom sampling was used to select teachers to ensure that results obtained from this sample approximate what would have been obtained if the entire population had been studied. The researcher started by deciding on the population of teachers to be studied, decided on the sample size and then randomly selected the sample through random number tables. Also the simple random sampling allows all the units in the population to have an equal chance of being selected. By using two pieces of papers one with the word included and the other with the word not

included. Then the pieces of papers were put in a box, roughly mixed up thus picking 10 pieces thus obtaining the sample for this study.

3.7 Data Collection Methods and Tool

Data collected in this study include both primary and secondary data. Various methods and tools in data collection have been employed in this study including the following ones:

3.7.1 Vision Screening Tests

The Eye Screening tests aimed at examining how the students vision functions so as to identify pupils who may have vision problems. This was an appropriate method for collecting data concerning visual functions of the pupils as well the visual problems that might hinder their learning.

The tools, which were used in Vision screening included *Lea Symbols* for Visual Acuity Tests (near and distance). Other tools included ruler, pencil, dolls, and eye patches in testing convergence, accommodation, eye movements, binocular vision, and fixation.

3.7.2 Observation

This was another method used in data collection for this study. It was important to observe the general environment of the classroom including light, sitting positions of the students, and color contrasts in the classroom. Also, observation was done to the condition around the student's eyes, which has been checked for swelling, discoloration, excessive tearing or discharge. The child's eyes were also observed to

see if one eye appears to turn in, out, up, or down in relation to the other. These were observed to see whether they contribute in vision disturbances to theses pupils.

However, this has been done during eye screening before and after vision stimulation. However, during data collection it was important to observe that, the eyes were supposed to be held steady, without excessive eye movement, while gazing straight ahead. The position of the head was also observed and noted to see if the participant was bending or tilting their head forward, backward or sideways.

The appropriate tool used was Observation Checklist.

3.7.3 Vision Stimulation Lessons

Various structured Lessons were used to stimulate vision improvement in this study. Main exercises on saccades, VA, VF, accommodation, convergence Smooth pursuits, fixation, visual attention and eye movements both horizontally vertically and diagonally were done for vision improvements. Comments were taken on endurance and concentration during vision lessons. In this study therefore data were collected through vision training activities. Various tools were use in vision stimulation including eye patches, Response card, Conditioning flashcards, Toys, Puzzel, Brock string, Heidi stick & pencil, Letters.

7.3.4 Interview Guide

In this study, the open interview guide has been used to grasp the general awareness of parents on vision and vision disturbances to their children. The parents were interviewed one by one three days before vision stimulation processes. Each respondent was interviewed for about 40 to 45 minutes. The researcher made an

appointment with them and asked them for the convenient time that she could visit and interview them. The respondents had to answer the open-ended interview questions orally. Two of the parents were interviewed at their home and two of them were interviewed at their working places. The data that were sought of through interview were the data for parents' awareness of visual disturbances to pupils. Either, the interview seemed to be appropriate to these respondents because most of them could not read well and write.

7.3.5 Focus Group Discussion (FGD)

The students also had to answer the questions in the Focus Group Discussion two days prior vision stimulation. The major aim was to know their awareness of vision disturbances and impairment. In the focus group discussion, respondents were asked about their perceptions attitudes, beliefs, opinion or ideas about vision disturbances and vision impairment.

During the discussion the researcher gave probing questions, which introduced participants to the discussion topic and make them feel more comfortable sharing their opinion with the group. Follow-up questions delve further into the discussion topic and the participants' opinions. Focus group discussion was used to collect data from pupils because it provide and create a safe peer environment for children.

Focus groups can also avoid some of the power imbalances between researchers and participants, for example, those between an adult and a child in a one-on-one interview. The focus group discussion was done for one 80 minutes. The tool used in this method was a focus group guide.

7.3.6 Questionnaire

This was another method used by researcher to collect data where the teachers were given questionnaires with a mix of both close-ended questions and open-ended questions.

The teachers filled in the questionnaire one by one during break time at school. The major aim was to see the extent to which they were aware of vision impairment and vision disturbances to the students. This method seems to be appropriate to teachers because they are educated thus could provide precise responses.

3.8 Data Analysis Methods

Collected data were analyzed descriptively by using simple statistical analysis. Measures of the central tendency (means) and disparity (standard deviation) were calculated to identify the vision elements with challenges and the changes of vision qualities stimulated. Case by case analysis and narration was also involved in analyzing and interpreting the data on the awareness of teachers, parents and students on vision disturbances as well as the effect of vision stimulation on vision improvement. The tables, graphs and explanations were used to support presentation and clarification of the findings.

3.9 Validity and Reliability of Research Instruments

The researcher ensured reliability and validity of the results through a number of ways including the following:

(i) Creating a strong research design, choosing appropriate methods and samples, and conducting the research carefully and consistently.

(ii) Control of factors that might affect the results including the use of school dispensary which is conducive thus providing appropriate environment for vision screening and vision intervention as well.

(iii) A pilot study was done prior to the field of study where the research instruments were pre-tested at a nearby Primary School. This was done to see if they can be easily used by the study respondents.

(iv) The researcher sought recommendations from the supervisor and other experienced fellows to improve clarity of wording and removal of ambiguities in the questionnaires, interview and focused group discussion guide.

3.10 Ethical Issues and Consideration

Ethical issues are very important for the researcher to observe in the whole process of any research, specifically those involving human beings (Resnik, 2005). I this study the researcher observed all ethical issues and national rules and regulations.

3.10.1 Research Clearance Permit

The chancellor in accordance with a government circular letter Ref. No. MPEC /R/10/1 dated 4th July 1980 is given power to issue research clearance to students. Thus a research clearance letter was sought from the vise chancellor of The Open University of Tanzania. This clearance letter was submitted to the Executive Director, Arusha Municipal for research permit.

3.10.2 Informed Consent and Assent

All participants were provided a written acceptance report form regarding their participation in the research, through a signed Consent and Briefing Letter. At the same time, sample members were asked to sign a debriefing and withdrawal letter see attachment number three. The aim of both letters was to reassure participants that their participation in the research is voluntary and that they are free to withdraw from it at any point and for any reason. Apart from that, participants were notified that they will not be harmed physically and psychologically during research process and this was done as agreed.

3.10.3 Confidentiality and Anonymity

Participants were informed regarding the objectives of the study, while been reassured that the results will be treated confidential and used only for this particular research. Apart from this, numbers were used to assign participants instead of using their names for the purpose of anonymity. Moreover, everything was kept anonymous.

CHAPTER FOUR

DATA PRESENTATION ANALYSIS AND DISCUSSION

4.1 Introduction

The previous chapter has presented the research methodology of the study. This chapter presents, analyze and discuss the major findings of the study in line with the study objectives stated in chapter one. The findings are presented into four main sections as follows:

4.2 Students' Vision Functions

The first objective of the study examined students' visual functions. Various aspects of visual functions were measured including visual acuity convergence, accommodation, eye movements, binocular vision, and fixation. After the measurements, vision stimulation lessons were done to the areas identified with challenges. Each participant had structured vision lessons for 45 minutes each for 21 days consecutively. The findings are reported as follows:

4.2.1 Visual Acuity

The visual acuity was measured at near and far to evaluate how they were able to see details at near in books and paper, as well as seeing letters, numbers and drawings on the chalkboard. The findings are indicated in Table 4.1.

The positive changes are marked with bold numbers and show that most of the measurements of visual acuity are better after the intervention. The results indicate for example, before stimulation both participants had poor visual acuity for each eye

separately and both eyes together. All the four students had some better results both on near-VA and distance-VA. For good visual acuity eyes have to see clearly at theh the level between 1.0 and 1.25.

Table 4.1: Results on Visual Acuity Near and Distance

Participant No		VA-near			VA-distance		
		od	**Os**	**ou**	**od**	**os**	**Ou**
1	**Pre**	0.50+1	0.63	0.80	0.80	0.80	0.80
	Post	**1.0**	**0.80**	**1.0**	**1.0+1**	**1.0**	**1.25+1**
2	**Pre**	0.63	0.63	0.63	0.63	0.80	0.80
	Post	**0.80**	**1.0**	**1.0+2**	**0.80**	0.80	**1.0**
3	**Pre**	0.80	0.80	0.80	0.63	0.50	0.50
	Post	0.80-2	**1.0**	**1.25**	**1.0**	**0.80+2**	**1.25**
4	**Pre**	0.80	0.80	0.80	0.40	0.50	0.63
	Post	0.80	0.80	**1.0**	**0.80**	**0.63**	**1.0**

Key: od = right eye, os = left eye, ou =both eyes together

Source: Field Data, 2020

This concur with previous studies which revealed that active vision stimulation through structured vision lessons has primarily been used in the treatment of strabismus, as well as other disorders of binocular function and ocular motility and brought positive vision improvement (Rodriguez et al., 2012; Li *et al.*, 2015; Therrien *et al.*, 2016).

Figure 4.1 illustrates the changes in visual acuity when both eyes are used together (ou). The doted bars show pre-intervention for near and distance visual acuity and the others illustrate the new visual acuity post intervention. The goal for a good visual

acuity is to reach the level between 1.0 and 1.25. However, to reach a good VA, an effective accommodation is necessary, and the convergence has to be kept steady at the nearly same distance. Therefore all four participants' vision increased to that normal area of visual acuity. It is very important for pupils to have quality vision so that they can comfortably perform various activities at school and outside the school.

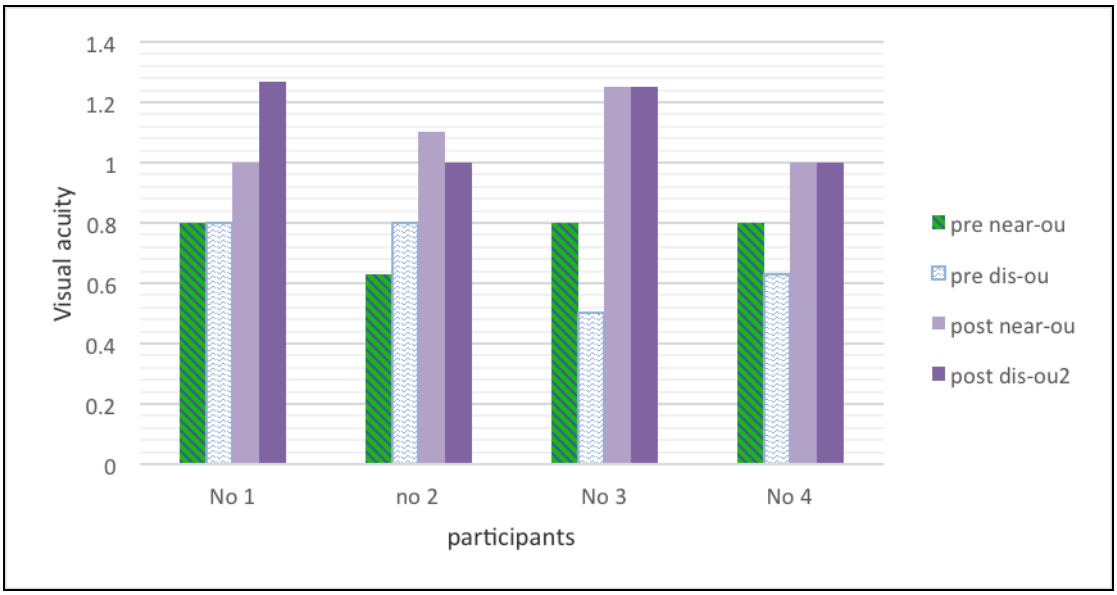

Figure 4.1: The Visual Acuity Pre and Post Stimulation for Near and Distance when both Eyes are used Together

Source: Field Data 2020

Key: ou =both eyes together

4.2.2 Accommodation and Convergence

To reach a good VA, an effective accommodation is necessary, and the convergence has to be kept steady at the nearly same distance. It is expected that the lens can accommodate as close as possible to the eye, at least between 8-6 cm but better if they can manage even closer. At the same time, it is expected that the two eyes also can work together as a team, converge at the same short distance.

A strong accommodation and a stable convergence will help the eyes to stay in power for near work over a longer period of time. These findings revealed that, all four participants got a stronger power for both accommodation and convergence measured after the stimulation compared to the results before they started the lessons for vision stimulation. The changes in cm show how many cm closer to the eyes an object is seen clearly (accommodation) and how much closer the eyes can work together (convergence).

These results are in line with previous studies (Scheiman, 2005, Seitz *et al.,* 2006; Xiao *et al.,* 2008; Wilhelmsen *et al.,* 2012, 2015,2016, 2018; Long et al., 2014), which also revealed great vision improvement through stimulation. Such studies suggest that vision stimulation using variety eye movement and eye focusing exercises have been used to remediate vision problems thus helping children to learn more through better visual inputs.

The results in Table 4.2 and figure 4.2 shows that all participant had a stronger power for both accommodation and convergence measured after the stimulation compared to the results before they started the lessons for vision stimulation. The changes in cm show how many cm closer to the eyes an object is seen clearly (accommodation) and how much closer the eyes can work together (convergence). However, these results support prior research (Kaplan, 2005; Kumaran, 2015; Read, Vincent & Collins 2014; Borsting, 2012, Wilhelmsen, 2018), which proves that most vision problems can easily be administered by vision stimulation.

Table 4.2: Changes of Accommodation And Convergence between the Pre- and Post-Test Measured in CM after Vision Intervention

No	Accommodation			Convergence		
	Pre	**Post**	**Change**	**Pre**	**Post**	**Change**
1	7 cm	5 cm	**+2 cm**	6 cm	5 cm	**+1 cm**
2	9 cm	7 cm	**+1 cm**	7 cm	5 cm	**+2 cm**
3	12 cm	7 cm	**+5 cm**	10 cm	7 cm	**+3 cm**
4	11 cm	8 cm	**+3 cm**	9 cm	7 cm	**+2 cm**

Source: Field Data 2020

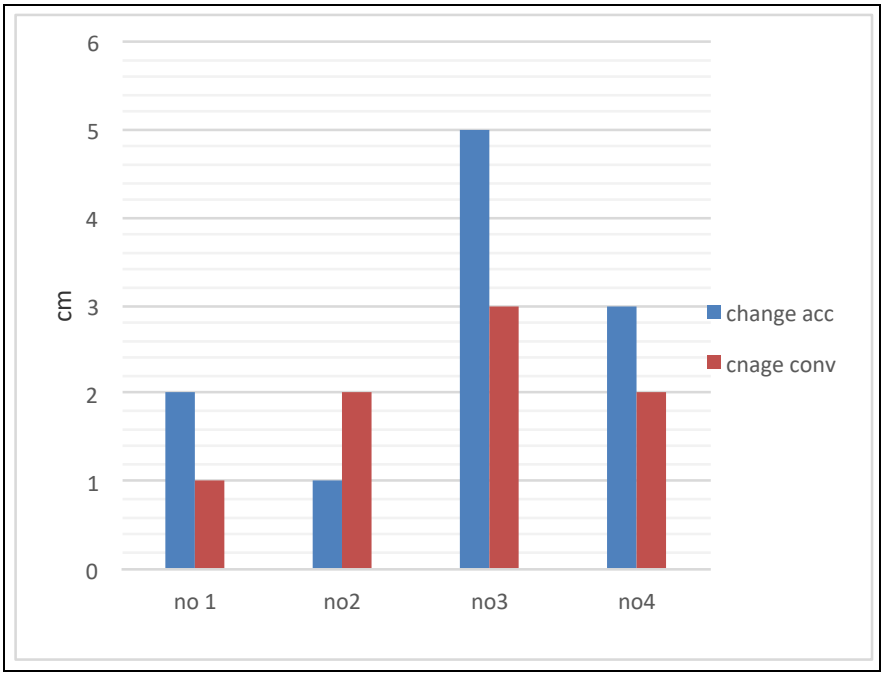

Figure 4.2: Changes of Accommodation and Convergence between the Pre- and post-Test Measured in cm from the Eyes for the Four Participants after Stimulation

Source: Field data 2020

4.2.3 Pursuit Movements

Participants' eye pursuits movements were also observed when they were following a moving object in different directions. Three of them had normal eye movements in all

directions, but one participant had problems doing diagonally movements before the intervention. Only participant number 4 has problems with diagonal eye movements. After vision stimulation this participants' eye movement improved. Previous studies (Maclinthosh 2015; Rawson et al., 2005; Josh et al., 2017; Ciufreda et al., 2008) insisted that through the use of variety of equipment and techniques including penlights, dolls, pencils, pictures for tracing, puzzle for completion, drawings, beards, balls, brock string can greatly help improve eye muscles during vision stimulation thus easy eye movements. Table 4.3 lists the observations of the participants' eye pursuit movements when they were following a moving object in different directions.

Table 4.3: Results on Pursuit Movement Tests Pre-and Post the Stimulation (N= Normall)

N		Horizontal	Vertical	Diagonal	Horizontal	Vertical	Diagonal
1	**Pre**	N	N	N	N	N	N
	Post	N	N	N	N	N	N
2	**Pre**	N	N	N	N	N	N
	Post	N	N	N	N	N	N
3	**Pre**	N	N	N	N	N	N
	Post	N	N	N	N	N	N
4	**Pre**	N	N	**Abnormal**	N	N	N
	Post	N	N	**N**	N	N	N

4.2.4 Covet Test (Near and Distance)

The cover-test was performed when the participants focused on a close object, and afterwards they had to focus on an object at a distance. Most of the results of the measurements were normal, which means that the covered eye was fixating on the same place as the not covered eye when the cover was removed. This is a sign of a

steady binocular fixation. Participant number 3 Table 4 had problems at near object before the stimulation. This participant was opening her eyes so widely that the eyes were producing tears during accommodation and convergence test.

The participant also did not manage to follow the object well during pursuit movement test, opening the eyes widely and the eyes were producing tears as well. After the intervention the test results were normal. Participant number 4, Table 4.4, showed abnormal results on both eyes and with both eyes together at near and when looking at a distant object. During VA test this participant's eyes were easily getting tired and could not see well some symbols. During Accommodation and convergence test both eyes could not come together while focusing on an object. The participants also claimed of eye nervous tension after the test procedures. This changed during the stimulation period and was normal on both eyes and binocularly when focusing at a near object as well as focusing on an object at a distance after the lessons.

Table 4.4: Results on Cover Test Near and Distance Pre- and Post the Stimulation

No		**Cover test- near**			**Cover test-distance**		
		Od	**Os**		**od**	**Os**	**Ou**
1.	Pre	N	N		N	N	N
	Post	N	N		N	N	N
2.	Pre	N	N		N	N	N
	Post	N	N		N	N	N
3.	Pre	Abnormal	Abnormal		N	N	N
	Post	N	N		N	N	N
4.	Pre	Abnormal	Abnormal		Abnormal	Abnormal	Abnormal
	Post	N	N		N	N	N

Key: (od-right eye, os- left eye, ou-both eyes, N-normal)

Source: Field Data 2020

4.3 Vision Problems Hindering Students Learning

The second objective of this study assessed visual problems hindering students learning. The analysis of data revealed a number of problems as follows:

From vision screening tests participants have poor visual acuity, poor convergence and accommodation, eye movement problems in either of the eye.

On interview with the parents, some of them revealed that there were times their children claim of headache or blur vision unknowingly of the vision disturbances. Also, during data collection process, some interviewed teachers also agreed that, there are signs of vision disturbances they see among students in classroom, which are obstacles to the children's reading and Learning.

One Teacher said:

> *" I have two children in my class who in most cases one claim of headache whenever I ask him to read a passage in a book and the other pupil normally doesn't want to seat near the chalkboard, but I never imagined it could be vision disturbance"*

4.4 Students, Parents and Teachers Awareness of Vision Disturbances

The third objective of this study aimed at assessing the extent to which pupils, parents and teachers were aware on vision disturbances. Parents were interviewed with semi-structured interview, while students were interviewed with a focus group discussion and teachers filled in mixed questionnaires. The results revealed that both parents' pupils and teachers had little understanding on vision disturbance.

One parent had to say:

> *"I used to see my child reading while putting his book very close to his eyes and he normally claim of headache. But I never knew it was vision disturbance".*

Either, one of the students during focused group discussion also admitted that:

"When I look on the chalkboard I see words like moving and I can't see well".

When she was asked what did she do when she feels that way, she replied that she used to ask her friend to write notes for her and that she was not aware if that was vision disturbance.

However, 2 of the 4 students were aware that they have vision disturbance. Although 3 of the students were interested in reading and writing but 2 of them experienced headache. 1 of the students experienced fogy letters when reading and writing but 1 of the 4 students experienced double vision. Either, 2 of students position the reading materials very far when reading and 2 of the students put reading materials very near to their face when reading.

From the interview 2 of the 4 parents were not aware that their children have vision disturbances, 1 parent was not sure if her child had vision disturbance and the other one suspected vision disturbances to their child. Either, 2 parents confirmed about their children claiming of headache and observed their children reading at a close distance. The other 2 parents observed their children reading at a far distance while one of them being unaware of any problem to their child.

On the other hand the findings on teachers' awareness of vision disturbances reveal that, only 1 of 10 teachers filled in the questionnaire had adequate knowledge on vision disturbances to learners while 1 teacher had moderate knowledge on vision disturbances to learners. 3 out of 10 teachers had limited knowledge on vision

disturbances and 4 teachers had no knowledge on vision disturbances. The 1 teacher was undecided about his understanding of vision disturbances.

This shows that students, parents and teachers had very little knowledge of vision disturbances. This indicates the urgency of teachers and parents having vision competence so that they can easily identify learners with vision disturbance thus taking early intervention measures.

CHAPTER FIVE

SUMMARY, CONCLUSIONS AND RECOMMENDATIONS

5.1 Introduction

This chapter concludes this report with a presentation of a research summary, conclusions and recommendations.

5.2 Summary of the study

The main objective of this study was to assess vision improvement through stimulation in primary school students in Arusha. The study was guided by three specific objectives including: Examine student's Vision functions in reading and learning, finding vision problems that may hinder some students in learning, and find out Parents, students and teachers awareness on disturbances. The study employed a mixed method approach. Four students' cases were studied through embedded design with a Quasi-experimental Design with pre-screening, vision intervention and post screening. Vision lessons were carried out after pre-screening for the four students identified with vision disturbances for 45minutes each for 21 days.

5.3 Summary of the Findings

It was found that, Participants had different vision problems before the intervention as both showed abnormal results in either of the following vision function assessed: Visual Acuity Monocular & binocular Near (40 cm) and Distance (3 m), Convergence, Eye Movements including Pursuit movements in all directions and cover test near & distance. These vision problems changed during the intervention period and were normal on both eyes and binocularly when moving in different

directions, when fixating at a near object as well as when fixating on an object at a distance after the lessons.

Visual functions which were stimulated included Fixation, visual attention, saccades in all directions, accommodation &convergence, monocular function, all ocular motor functions, pursuit movement, visual searching, simultaneous overview, eye-hand coordination, visual acuity near &distance, balance and eye movements in all direction. Consequently, both participants reach better vision functions after vision stimulation.

5.4 Conclusions

From this study therefore, the most significant finding is that vision can be improved through stimulation. Because vision plays a vital role in the reading process children who lack good basic visual skills often struggle unnecessarily in school. Vision improvement through stimulation can be effective way in intervening vision disturbances to learners.

Insights into vision and vision education can be most useful thus more should be done in implementing methods and principles of increased vision capacity for better learning when pupils have disturbed vision. This study however insists and argues for early vision intervention to be in schools to reduce the number of children with vision disturbance who receive late diagnosis.

However, vision intervention might need to be provided at repeated intervals in order to enhance students visual function to sustain good quality vision through good visual

acuity at near and distant, endurance in accommodation and convergence as well as normal eye movements in all directions. This study has so far shown that teachers are in the need of more competence on vision functions, vision development and the knowledge of how vision disturbances influence pupil's academic development. Some teachers ought to be able to do vision functional screening on vision qualities important for reading, and to be qualified to carry out educational methods for better vision.

5.5 Recommendations for Policy, Action and Further Research

Based on the findings and conclusions of this study, the following recommendations are put forward.

5.5.1 Recommendation for Policy

The government and the policy makers are argued to plan for vision screening and examinations for children prior to their enrollment. This will enable early identification thus early intervention. However, re-screening programs should also be done to assess the progress of identified learners as well as those who got vision challenges along their studies.

5.5.2 Recommendations for Action

This study has shown that there is a need of early vision screening and identification for learners with vision disturbances. This will secure early identification for early intervention as well. Presence of undetected vision disturbances is among obstacles for learner's academic achievement because in most cases they are disturbed with blurred vision, headache, and double vision. Therefore the outcomes of this study are

relevant not only to primary school teachers but they are also applicable in other educational levels.

5.5.3 Recommendations for Future Research

Investigation of other methods of suitable vision improvement through stimulation would be helpful and provide more knowledge in this field. However, using more samples might also show substation of the generalizations of the results. Beyond this direct study, three other areas of investigation were suggested.

(i) One is the implementation of vision research in special needs education in Tanzania.

(ii) Another area of potential investigation is the influence of quality vision on learner's academic performance.

(iii) The third area is on Effects of undetected vision disturbances to learner’s development.

Generally, many areas of investigation concerning vision disturbances to learners and their intervention remain to be examined.

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APPENDICES

Appendix 1: Questionnaire for Teachers

General Information

1.1 Name (optional)…….

1.2 School(optional)…….....

1.3 Subject……..

1.4 How long have you been teaching …….

Specific Information

1. What is your understanding of the term vision disturbance?

.....

.....

2. Mentioned below are the different signs of vision disturbances to students please tick those that are handled at your institution that you are aware of (Tick asmany as applicable):

Types of disability Tick

a) Headache

b) Double vision

c) Blurry letters

d) Difficulty copying notes from the blackboard at far distance

e) Difficulty copying notes from a book at near distance

f) Difficult finishing assignments timely

g) Others please mention

3. Please indicate whether you agree, disagree or don't know whether the factors

Listed below are hindrances to students reading and learning in your class (Your responses are limited to Yes, No or Don't Know):

Na	Factor	Yes	No	Don't know
	Blarry vision			
	Double Vision			
	Tired eyes			
	Headache			
	Squint eyes			

4. If you agree, how have you handled the challenges and with what results?

	Problem	Strategy	Results
a	Take a child to a hospital		
b	Take a child to an assessment centre		
c	Taking a child to a special school		
d	Make classroom adjustments		
e	Others (Specify)		

5. Apart from the above mentioned problems what other problems do you think face the children with vision problems and how have these problems affected reading and learning of the students in your class?

Problem	**How it affects reading and learning**

6. Do you think vision has any connection to children's learning? Briefly explain.....

.....

.....

7. Do you think vision disturbances can be corrected?

Yes	No	Don't know

8. Give reasons for your answer

.....

9. How many vision teachers do you have in your school?

…… …….. ..……

b) Do you think the number of vision teachers is sufficient?

Yes No don't know

c) If no, what advice can you provide?

……

……

11. In your view is vision disturbances well known to teachers?

Yes No don't know

a) Give reasons for your answer

……..……

……

THANK YOU FOR YOU TIME

Appendix II: Focus Group Discussion for Students

1. Do you think that you have Vision disturbances?
2. Do you like reading and writing?
3. How do you feel when you sometimes read a book, notes from the blackboard, in your exercise books?
4. Do you see clearly when reading a book, notes from the blackboard, in your exercise books?
5. When reading a book, newsletter or magazine where do you position/ put it Very near, very far, in a normal distance?
6. Can you explain briefly the difficulties you find when reading and learning in the classroom?

Appendix III*:* Semi Structured Interview Guide for Parents

No	Question
1.	Do you know anything about Vision Disturbances? If Yes, Briefly explain:
2	Do you think your child has a vision disturbance? □ Yes □ No □ I don't know
3	Do you think your child like reading and studying? □ Yes □ No □ I don't know
4	When reading, is your child claiming about: □ Headache □ Double vision □ Tired eyes □ Blurry vision Double vision □ Never heard him/her □I don't know
5	When your child reads a book or magazine, does she/he put: □ Very near the face □ Very far to the face □ In the normal distance

Appendix IV: Concert Letter

Good vision is important for almost all activities in school, in particular reading. Patandi College of Special Needs Education, carried out a vision screening of pupils in 2018 and some pupils were trained in 2019 together with researchers from Norway and Germany. Now we want to follow up some of these children and your son/daughter is one of them

Anonymous

The activity will go from: …… to …… and go on for 45 minutes daily. The work will be conducted of vision teacher at Patandi Teachers College of Special Needs Education as part of her Masters' degree at Open University of Tanzania. We hope to help your child even more and learn even more about the connection between reading and vision. All collected results will be stored without names.
You may contact headmaster, at Arusha Primary School if you need more information, phone 0753 091 934.

This work follows the ethical rules of the Tanzanian research regulations under the National Research Council as well as those connected to the Open University of Tanzania. It is voluntary to participate, but we hope everyone will join it. ***Please reply on the registration form on the next page and return it to school before….***

Best regards

_____

Vision teacher
Masters' Student

My/our child (name):
_____

A. Do you have the impression that your child has any vision disturbances?

 yes no don't know

B. Do you think your child is fond of reading and writing?
 yes no don't know

C. When reading does your child sometimes complaining about:

 headache double vision tired eyes foggy letters

 never complaining I don't know

 I/we want our child to join vision training at Arusha Primary school

 I/we do not want our child to join the vision training at Arusha Primary school

Parents/guardians signature:

Appendix V: Pre-screening Forms

<table>
<tr><td colspan="2">Participant Number:</td><td colspan="2">Age:</td><td colspan="2">Gender:</td></tr>
<tr><td colspan="6">Have you screened your vision earlier?</td></tr>
<tr><td rowspan="4">Acuity</td><td rowspan="2">1) Near (40cm)</td><td>od</td><td>os</td><td colspan="2">Comments:</td></tr>
<tr><td>ou</td><td colspan="3">Tried:</td></tr>
<tr><td rowspan="2">2) Distance (3m)</td><td>od</td><td>os</td><td colspan="2">Comments:</td></tr>
<tr><td>ou</td><td colspan="3">Tried:</td></tr>
<tr><td colspan="6">Did you find this difficult?</td></tr>
<tr><td>Accommodation</td><td colspan="5">3b) Accommodation: _____cm
Comments:</td></tr>
<tr><td>Convergence</td><td colspan="5">3b) Point of convergence: _____cm
Comments:</td></tr>
<tr><td>Pursuit Movements</td><td colspan="2">4c) horizontally:
☐ normal
☐ abnormal</td><td colspan="3">Comments:</td></tr>
<tr><td></td><td colspan="2">4d) vertically:
☐ normal
☐ abnormal</td><td colspan="3">Comments:</td></tr>
<tr><td></td><td colspan="2">4e) diagonally:
☐ normal
☐ abnormal</td><td colspan="3">Comments:</td></tr>
</table>

Appendix VI: Re-screening Forma

Participant Number:	Age:		Gender:
Have you screened your vision earlier?			
Acuity Acuity	**a) lear (40cm** **1) Near (40cm)** : **1b) Dis** **2) Distance (3m)**	os Tried:	Comments:
Did you find this difficult?			
Accommodation	**3b)** Accommodation: _____cm Comments:		
Convergence	**3b)** Point of convergence: _____cm Comments:		
Pursuit Movements	**4c)** horizontally: ☐ normal ☐ abnormal	Comments:	
	4d) vertically: ☐ normal ☐ abnormal	Comments:	
	4e) diagonally: ☐ normal ☐ abnormal	Comments:	

Appendix VII: Observation Checklist

Participant No.		
	Item	Comments
1.	Eye conditioning	
2.	Eye Movements	
3.	Saccades	
4.	Fixation	
5.	Head position	
6.	Classroom Light conditioning	
7.	Sitting position	

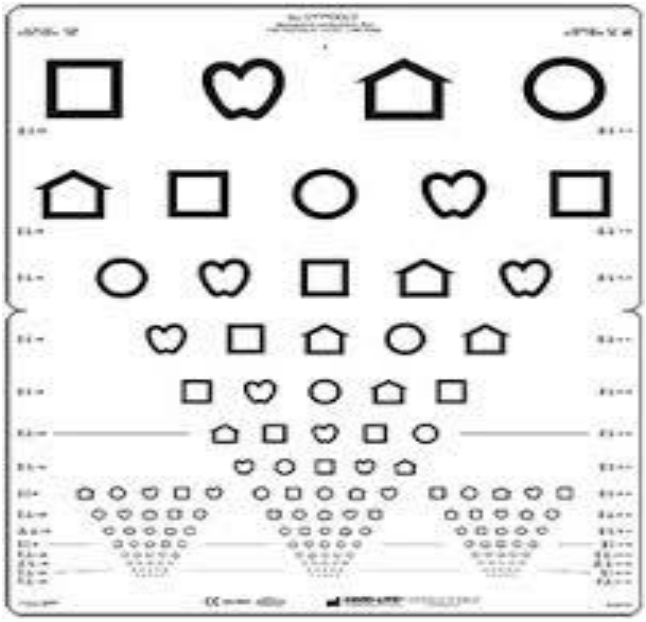
Appendix VIII: Daily Report for Vision -Lessons

Number:	Date:			
Warm up exercises	Saccades od: os: ou:	Head position	Eye movements Horizontal: Vertical: Diagonal:	Convergence
Comments to the warm up:				
Main exercises	1. 2. 3. 4.			
Comments to the main exercises:				
General	**Endurance** -short -easily tired-rubbing eyes-tears-goes better Each eyes/both eyes: Concentration: -easily distracted-rather good-easily tired-good			
Remember to next time:				
Signature:				

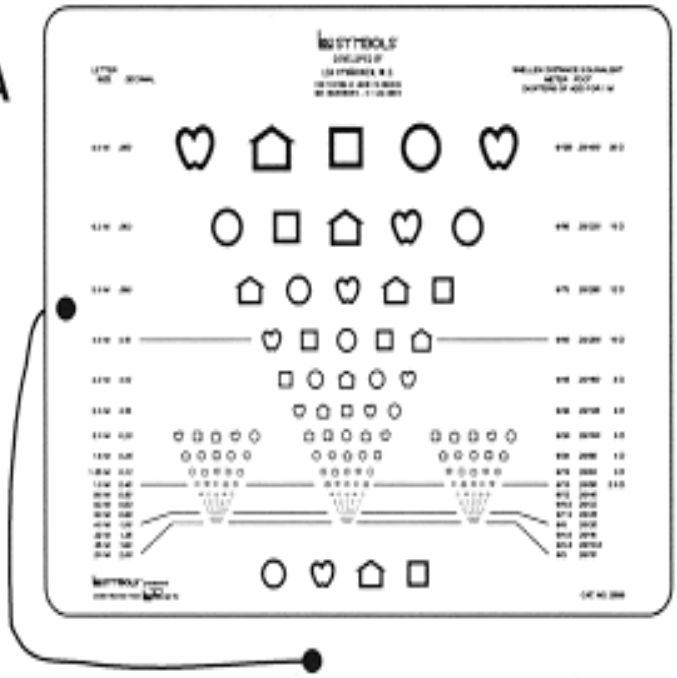
Appendix IX: Items for training connected to different vision function

Items	**Stimulating vision functions**
Response card	Fixation, visual attention, saccades
Conditioning flashcards	Fixation, visual attention, saccades, accommodation & convergence
Eye patches	For monocular training
Toys	As variation of fixation object for all ocular motor functions
Puzzel	Visual searching, visual attention, fixation, simultaneous overview, eye-hand coordination, visual acuity
Brock string	Accommodation and convergence, saccades in all directions
Heidi stick & pencil	Smooth pursuits and accommodation & convergence
Letters, close and far away	Accommodation, convergence, saccades, balance, eye-hand coordination

Appendix X: Lea Chart for Testing Visual Acuity (Near and Distance)



A



Appendix XI: Research Clearance Letter

THE OPEN UNIVERSITY OF TANZANIA

DIRECTORATE OF POSTGRADUATE STUDIES

P.O. Box 23409
Dar es Salaam, Tanzania
http://www.openuniversity.ac.tz

Tel: 255-22-2668992/2668445
ext.2101
Fax: 255-22-2668759
E-mail: dpgs@out.ac.tz

REF: PG201609510

Executive Director,
Arusha Municipal,
P. O. Box 3013,
ARUSHA.

3rd August, 2020

RE: RESEARCH CLEARANCE

The Open University of Tanzania was established by an Act of Parliament No. 17 of 1992, which became operational on the 1st March 1993 by public notice No.55 in the official Gazette. The Act was however replaced by the Open University of Tanzania Charter of 2005, which became operational on 1st January 2007. In line with the Charter, the Open University mission is to generate and apply knowledge through research.

To facilitate and to simplify research process therefore, the act empowers the Vice Chancellor of the Open University of Tanzania to issue research clearance, on behalf of the Government of Tanzania and Tanzania Commission for Science and Technology, to both its staff and students who are doing research in Tanzania. With this brief background, the purpose of this letter is to introduce to you Mr. **Alida Sebastian Kauki**, Reg No: **PG201609510** pursuing **Master of Education in Administration, Planning and Policies Studies**. We here by grant this clearance to conduct a research titled "***Assessing Vision Improvement through Stimulation to Primary School Students in Arusha, Tanzania***". She will collect her data in your municipal between 5th August to5th September 2020.

In case you need any further information, kindly do not hesitate to contact the Deputy Vice Chancellor (Academic) of the Open University of Tanzania, P.O. Box 23409, Dar es Salaam. Tel: 022-2-2668820.We lastly, thank you in advance for your assumed cooperation and facilitation of this research academic activity.

Yours Sincerely,

Prof. Hossea Rwegoshora
For: VICE CHANCELLOR
THE OPEN UNIVERSITY OF TANZANIA

Appendix XII: Research Permit

UNITED REPUBLIC OF TANZANIA
PRESIDENT'S OFFICE
REGIONAL ADMINISTRATION AND LOCAL GOVERNMENTS

ARUSHA CITY COUNCIL

All correspondences addressed to:

Phone: +255 27 2508073/2503494 (Director)
+255 27 2544330 (General)
Fax: +255 27 2545768
On reply please quote:
Ref. No. CD/R.30/32/41

City Director,
20 Boma Street,
P.o Box 3013,
23101, ARUSHA,
e-mail: cd@arushacc.go.tz
Website:www.arushacc.go.tz
Date: 09TH .July2020

To Headteacher,
ARUSHA PRIMARY SCHOOL
P. O. BOX
ARUSHA

RE: LETTER FOR INTRODUCTION

The heading above is concerned.

I would like to introduce ALIDA SEBASTIAN KAUKI
student from THE OPEN UNIVERSITY OF TANZANIA.
who is doing a research titled:
ASSESSING VISION IMPROVEMENT THROUGH STIMULATION TO PRIMARY SCHOOL STUDENTS IN ARUSHA TANZANIA

Please may you assist him/her to collect the data in the respective area.

Thanks in advance for your cooperation.

Kwesiga, O. A
For, ARUSHA CITY DIRECTOR.

K. A. Y. MKURUGENZI WA JIJI
HALMASHAURI YA JIJI LA ARUSHA