DEVELOPMENT OF LEARNING MEDIA ASSESSMENT INSTRUMENT FOR LEARNERS WITH DISABILITIES: A CASE OF SHIRE HIGHLANDS EDUCATION DIVISION IN MALAWI

MASTER OF EDUCATION (TESTING, MEASUREMENT AND EVALUATION) THESIS

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DEVELOPMENT OF LEARNING MEDIA ASSESSMENT INSTRUMENT FOR LEARNERS WITH DISABILITIES: A CASE OF SHIRE HIGHLANDS EDUCATION DIVISION

M.ED. (TESTING, MEASUREMENT AND EVALUATION) THESIS

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DECLARATION

I, the undersigned, hereby declare that this thesis is my original work which has not been submitted to any other institution for similar purposes. Acknowledgments have been made where other people's work has been used.

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Full Legal Name

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Signature

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Date

CERTIFICATE OF APPROVAL

The undersigned certifies that this thesis represents the student's work and effort and has been submitted with our approval.

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DEDICATION

To all learners with disabilities in Malawi and beyond.

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ABSTRACT

The Malawi system for assessing learning media for Learners with disabilities in schools highlights several difficulties that may be worth considering. For instance, the usage of a Low vision tool kit, Informal assessment, and use of Western instruments reveals a gap in the psychometric features of learning media assessment instruments. In other words, the system has an impact on content validity, construct validity, and reliability. The study aimed to develop a learning media instrument for Malawian Learners with disabilities. The results of the study revealed that 41 items under three main domains were developed. These domains include Sensory channels, Functional vision, and Literacy media. This was drawn from literature review and interviews. Then the items were exposed to statistical processes. The content validity was calculated was calculated using Lawshe's CVR. The CVR value of all these 41 items was equal to 1.00 CVI. Component factor analysis with rotated varimax in each domain was also conducted to establish the construct Validity. The results for sensory channel and Functional vision domains indicated that three factors for each domain were extracted, while the Literacy media domain indicated that four factors were extracted. The loadings on a component matrix of the three domains show that all the items were found to be moderate to high (0.518 - 0.930). The cumulative percentage of variance in the domain ranges from 58. 5% to 79.246% which is higher than the cutoff point of >0.50. Furthermore, the Internal consistency reliability of the instrument was established using Cronbach's alpha. The results show that the values were above 0.80 indicating good internal consistency. This indicates that the developed LMA instrument is valid and reliable, hence it can produce reliable inferences. This can assist teachers and relevant stakeholders in making good decisions on the appropriate learning media for learners with disabilities. This in turn will improve Inclusive education and, more especially, help learners with disabilities to have equal access to education and realize their potential.

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LIST OF ABBREVIATIONS AND ACRONYMS

CFA	Confirmatory Factor Analysis
CTT	Classical Test Theory
CVI	Content Validity Index
CVR	Content Validity Ratio
DB	Deaf-Blind
DIF	Differential item functioning
EFA	Exploratory Factor Analysis
FVA	Functional Vision Assessment
HI	Hearing Impairment
I-CVI	Item Content Validity Index
IE	Inclusive Education
IRT	Item Response Theory
KMO	Kaiser- Meyer-Olkin test
LMA	Learning Media Assessment
MANEB	Malawi National Examination Board
MDS	Multidimensional Scaling
MOEST	Ministry of Education Science and Technology
PAF	Principal Axis Factoring
PCA	Principal component analysis
PEA	Primary Educational Advisor
S-CVI	Scale Content Validity Index
SHED	Shire Highlands Education Division
SPSS	Statistical Package of Social Sciences
UA	Universal Agreement
UNESCO	United Nations Educational, Scientific and Cultural Organization.
UNIMAREC	University of Malawi Research Ethical Committee
UNICEF	United Nations International Children's Emergency Fund
USA	United States of America
VI	Visual Impairment
WHO	World Health Organisation

CHAPTER 1

INTRODUCTION

1.1 Chapter overview

This chapter introduces the background information of the Inclusive Education and assessment tools used in Malawi to assess the learning media of learners with disabilities. The chapter also presents problem statements, the purpose, and the significance of the study. It further provides the definitions of concepts and terms that were used throughout the study.

1.2 Background of the study

The international instruments provide a legal and structural framework for managing children with diverse needs in an inclusive educational setting. These instruments include; the World Conference on Education for All, Jomtien (1990); the Salamanca Statement and Framework for Action on Special Needs Education, (UNESCO 1994). The instruments have advocated for a strong and collective international commitment that stimulates individual countries worldwide to develop education for underprivileged and disadvantaged children (Marina, 2014). More importantly, Adoyo (2017) indicated that inclusive education involves the transformation of regular schools into barrier-free environments to accommodate all learners irrespective of their abilities. Galevska and Pesic (2018) explain that inclusive education means that the child with special educational needs goes to school with his or her friends; programs and methods of teaching are adapted according to its possibilities.

The Malawi Government as a Sovereign country also puts much emphasis on inclusive education. It has adopted global policies and frameworks in response to international instruments. For instance, the Malawi National Education disability act, and Inclusive Education Act (2013), and Special Needs Education guidelines (2008). All these policies

and acts advocate for the fundamental principles of inclusive education including access, equity, participation, and equality; to increase the opportunity for learners with diverse needs including those with disabilities to acquire quality education. In the implementation of these national policies and acts concerning inclusive education in Malawi, the Ministry of Education Science and Technology in conjunction with Save the Children, developed an Inclusive Education Tool kit as an instrument for identifying learners with diverse needs, (MoEST, 2018).

1.2.1 Inclusive Education Tool Kit in Malawi

The Inclusive Education tool kit is an instrument comprised of three paraphernalia that assist in moving policy and practice towards achieving inclusion in all schools in Malawi, (ibid). These paraphernalia include the following; Learner Identification tools, Lesson observation tools, and School assessment tools. The main aim of this instrument is to improve access to education among deprived and marginalized learners.

This study, however, focused much on the Learners' identification tools for learners with disabilities, such as Visual impairment, deaf-blindness, and Multiple Disabilities with Visual impairment. The main purpose of these instruments was to identify and categorize learners to give them educational opportunities, (MoEST, 2018). This is an intervention towards inclusive education and has resulted in enormous enrolment of learners with diverse needs in mainstream schools. For instance, the Ministry of Education, Science, and Technology in Malawi reported that the number of learners with diverse needs enrolled in primary schools increased from 115,000 in 2015 to 146,043 by the end of 2017 (Chimjeka, 2018). This represents an increase rate of 27%. This shows that the Inclusive Education tool kit has contributed towards inclusive education in Malawi, and indicates an increased access to education among the learners with disabilities in Malawi.

However, research has shown that identifying learners and categorizing is not enough. A comprehensive learning media assessment is needed to take into account multiple domains, (American Printing House for the Blind, 2016; Roberts and Pogrund, 2013; Holbrook, Koenig and Apple, 1999; Edward sand McClean, 2016). Learning Media Assessment is a

tool that provides the unbiased process of systematically selecting learning and literacy media for learners with disabilities regardless of the level of vision or severity of the actual disabilities, (Koenig and Holbrook. 1995; Roberts and Pogrund, 2013). It assesses the sensory channels, functional vision, and literacy media of individual learners, (Bruce, et al, 2016).

1.2.2 Malawi's Learning Media Assessment and Practice

In Malawi, the approaches to learning media assessments in schools, encompasses a variety of methodologies to accommodate learners with disabilities. One key method involves the use of a Malawi-Low-Vision tool kit, (refer to Appendix 2). It works alongside with specialized tools and resources such as Snellen Chart and pin hall camera., to assess learners with visual impairment. Additionally, informal assessments are commonly employed, allowing teachers to evaluate learner's leaning needs. Furthermore, some use western instruments which introduce standardized methods. Below is a scrutiny of each method described above.

1.2.2.1 Low vision Tool Kit

The low vision tool kit is an instrument that is mainly used by specialist teachers who have specialized in visual Impairment and deaf-blindness. It assesses visual acuity which determines the distance and near vision acuity only, *(refer to Appendix 2.* This indicates that there is an under-representation of the content of what is supposed to measure learning media. (Sireci and Zenisky (2006), argue that, under-representation of items poses a threat to content validity. Furthermore, the instrument that misses out on some of the elements that help to measure the intended purpose, that instrument is likely to be unreliable and invalid, (Misseck, 1995; Kelley et.al, 2003; DeVellis, 2017; Nunnally, 1978). In addition, the use of a low vision tool kit is likely to miss out on some useful domains as it only assesses visual acuity. This shows that the instrument lacks some elements of what is intended to be assessed. This also poses a threat to content validity. It is argued that if an instrument lacks the degree of what it is supposed to measure, it yields poor results, (Krippendorff, 2013; Spooner et al, 2015).

1.2.2.2 Informal assessment

The informal assessment is mainly practiced by teachers and head teachers. They only observe the characteristics of the learners with disabilities. This practice, however, can lead to measurement error since different assessors may set items to measure different variables. Informal assessment may also compromise the psychometric procedures for conducting assessments. Nunnally and Bernstein (1994) argue that these procedures may lead in production of inconsistent or unstable results over repeated administration or under different conditions. This inconsistency weakens the trustworthiness of the measurement. In addition, Anastasi and Urbina (1997) argue that a lack of reliability leads to variability in obtaining results from informal assessments. In addition, the informal assessment may lead to inconsistency since each assessor may choose his or her variables for assessment. This also leads to inconsistency. The inconsistency of results among different assessors affects the reliability of the instrument, (DeVellis 2017; Bryant and Bryant, 2016). Besides that, it may also lead to an under-representative of variables. If important variables are under-represented, the instrument may not fully capture the construct resulting in incomplete or biased inferences (Polit and Beck, 2006; Kline, 2013). This can affect the accuracy of the conclusions drawn from that kind of measure. Under-representation of variables can also lead to incorrect interpretation, as the measured data might not reflect the true state of the construct, (Hayness et.al, 1995). This can lead to misguided decisions on the appropriate learning media.

1.2.2.3 Western instruments

Research has revealed that middle and low-income countries mostly depend on instruments from developed countries, (Hayes et.al, 2018). In other words, they often use imported Western norms. As such, this brings in the incompatibility of item constructs with the norms of a particular local country. Ngauriya (2004) also found out that Western instruments that are being used in Africa for assessment lack cultural aspects that may relate to everyday life activities expected by local societies. The lack of sensitivity to cultural differences does sometimes raise ethical issues. The assessments may vary from one cultural setting to another, for example, language and cutoff points of measurements may vary from one country to another. This indicates that there is a gap in the construction

of items. Sireci, (2006) states that lack of construct validity can lead to inaccurate interpretation of results. Colorado Department of Education, (2010) also recommended that such an instrument needs to be developed based on individual cultural settings. Therefore, developing an LMA instrument that responds to the needs of society is not only essential but meaningful as well.

1.3 Problem Statement of the Study

The Malawi system of conducting Learning media assessment raises several issues that may be of interest to consider. For instance, the use of a Low vision tool kit, Informal assessment, and use of Western instruments expose a gap in the psychometric properties of learning media assessment instruments. In other words, the system affects content validity, construct validity, and reliability. This can lead to invalid inferences on the appropriate learning media of individual learners with disabilities. It is likely that, learners with disabilities are given the wrong literacy media and wrong materials during the teaching, learning, and examination processes. Consequently, it is argued that learners with disabilities develop negativity toward school if their needs are not met, (Tartaryns et al. 2017; Dyson, et.al, 2004). Thus, may likely result in high repetition and dropout rates among learners with disabilities. Surveys conducted by Action Aid (2020) also reported that there is a higher proportion of 15.7% dropout rate for children with disabilities with a comparison of 13.2% for children without disabilities. This is a signal that learners with disabilities face challenges in an inclusive education setting. This circumstance in turn may effectively hinder Inclusive Education. Therefore, to minimize this problem, there may be a need to develop a learning media assessment instrument that undergoes psychometrical processes and responds to needs that align with the Malawi context.

1.4 Objectives

1.4.1 Main objective of the study

The main purpose of the study was to develop a learning media assessment instrument for learners with disabilities.

1.4.2 Specific objectives of the study

The specific objectives of this study included the following:

- To develop items for the new learning medium assessment (LMA) instrument.
- To examine the Validity of the LMA instrument.
- To examine the reliability of the learning medium assessment (LMA) instrument.

1.5 Significance of the study

The study on the development of the LMA instrument would the help Teachers and Specialist Teachers have consistency learning media for learners with disabilities from different assessors. Misseck (1989) states that consistency helps to realize reliability. This means the results acquired from the instrument can be used by anyone. In addition, the instrument can offer guidance to teachers or educational practitioners to make decisions on the appropriate learning media for individual learners in a school or a classroom, (Bruce et al, 2014). For instance, Teachers would be able to use appropriate teaching strategies and teaching, learning, and assessment materials suitable for learners with disabilities. It would also help them to understand the needs and preferences of the learners, and be able to adapt and modify instructions to support the learners. In addition, the instrument would assist teachers to identify and design an individualized educational plan (IEP). Furthermore, it would assist in the identification of appropriate assistive technologies to support learners with disabilities, such as reading stands or magnifiers. Finally, the developed instrument will help a teacher to do the appropriate seating plan.

The developed instrument would help stakeholders, such as the Malawi National Examination Board (MANEB) to develop appropriate examinations for learners with disabilities. In addition, the Learning Media Assessment instrument will act as a monitoring and evaluation tool for both conventional and functional literacy for learners with disabilities, (Browder and Sooner, 2011). The developed instrument can be adopted into the National Reading Program in Malawi. On another note, it will help administrators to purchase appropriate teaching and learning resources for a school. In this regard, inclusive education can be a reality because there will be equity and equality among all learners despite their disabilities.

The study also significantly contributes to the existing body of psychometrics. The study gave insights into how to test the validity and reliability in the development of psychometrically comprehensive assessment instruments. It would help developers of an instrument to have knowledge on how to generate ideas for item development for an LMA instrument from scratch.

1.6 Definitions of operation of terms

1.6.1 Deafblindness

It is a unique and complex disability characterized by loss of both vision and hearing. This dual sensory impairment creates significant challenges in communication, information access and mobility, (Miles and Riggio, 1999).

1.6.2 Disability

It is an umbrella term covering impairments, activity limitation, and participation restriction, (World Health Organization, 2017). This refers to the loss of the function of a body part due to impairment or the restrictions that the impairment causes disability. In this study, therefore, disability refers to the following impairments: Visual impairment, deaf-blindness, and Multiple disabilities with Visual Impairment (MDVI).

1.6.3 Factor analysis

This is a statistical method used to describe validity among observed correlate variables in terms of a potentially lower number of unobserved variables called factors, (Bartlett, 1950). In addition, it is a method that helps to identify underlying relationships between variables in the dataset, (Tabachnick, and Fidel, 2013; Field, 2018). It also helps to identify the number and nature of factors that best represent the data.

1.6.4 Factor Loadings

These are also called component loadings in PCA and are the correlation coefficients between the cases and factors, (Bartlet, 1950). In other words, they are coefficients that represent the relationship between observed variables and latent factors.

1.6.5 Functional vision

It refers to what a person can see, rather than what they can't see. It is useful in the development of Learning Media Assessment Instruments since it allows teachers to maximize how learners use vision in different situations, and how they can modify their teaching to assist learners with disabilities.

1.6.6 Functional Vision Assessment

It measures how well a child uses vision to perform routine tasks in different places and with different materials throughout the day.

1.6.7 Inclusion

It is where there is recognition of a need to transform the cultures, policies, and practices in school to accommodate the differing needs of individual learners and an obligation to remove the barriers that impede that possibility (Webinar 1- Companion Technical Booklet).

1.6.8 Inclusive Education

It is a process of addressing and responding to the diverse needs of all learners through increasing participation in learning, cultures, and communities and reducing exclusion within and from education. It involves changes and modifications in content, approaches, structures, and strategies, with a common vision that covers all children of the appropriate age range (Webinar 1- Companion Technical Booklet).

1.6.9 Inclusive Setting

It is a place where all learners can learn and participate, meaningfully together (Webinar 12- Companion Technical Booklet).

1.6.10 Literacy media

Literacy media refers to how learners access the general education curriculum and include braille, print, auditory strategies, objects, and pictures.

1.6.11 Multiple Disabilities with Visual Impairment (MDVI)

It is a condition whereby an individual has visual impairment plus other two or more disabilities**,** such as hearing impairment, physical neurological disabilities, learning disabilities, and orthopedic, (Halbrook and Koenig, 2000; Salleh and Mohd Ali, 2010).

1.6.12 Varimax Rotation

It is an orthogonal rotation of the factor axes to maximise the variance of the squared loadings of a factor (column) on all the variables (rows) in a factor matrix, which has the effect of differentiating the original variables by extracting factor, (Hair, Anderson, Tatham and Black, 2005).

1.6.13 Visual Acuity

Visual acuity is the angular measurement of the amount of clarity that a person has with his vision in relation to an object of a particular size in day-to-day life, (World Health Organization, 2018).

1.6.14 Visual impairment

Visual impairment (VI) is a condition of reduced visual performance that cannot be relieved by refractive correction such as the use of spectacles or contact lenses, surgery, or medical procedures. Consequently, it results in functional limitations of the visual system that may be characterized by irreversible vision loss, restricted visual field and decreased contrast sensitivity, increased sensitivity to glare as well as decreased ability to perform activities of daily living, such as reading or writing, (Naipal, and Rampersad, 2018).

1.7 Thesis structure

The thesis is divided into five chapters namely; Introduction, review of related literature and research, research methodology, result and discussion of the study and summary, conclusion, and implications. The chapters are divided into sections based on the content being addressed. The other parts that make up the thesis are the references and appendices.

1.8 Chapter Summary

The chapter provides background information on the study, where the international instruments concerning inclusive education are highlighted. Instruments such as the Salamanca statement on special needs education provide the framework for learners with disabilities to have access to education. The chapter also provides the practices and theories of conducting Learning media assessment in Malawi. This exposes the gap in the psychometric properties of conducting LMA. The next chapter is the literature review of related issues to the study.

CHAPTER 2

LITERATURE REVIEW

2. 1 Chapter Overview

This chapter provides an overview of the literature that is related to Learning Media Assessment constructs and their framework. The review begins with a description of Learning Media Assessment (LMA) followed by a detailed portrayal of the underlying or internal structure of the LMA constructs that were used in the modeling of this study. The chapter also discusses the psychometric properties and measurements that underpin the development of the LMA instrument.

2.2 Assessment of Children with Disabilities

Assessment in general is defined as a systematic process of acquiring, evaluating and interpreting information in measurable terms, (Poehner, 2007). The assessment of children with disabilities involves a comprehensive and multidisciplinary approach that evaluates individual needs abilities that are potential for each child, (UNESCO, 2009; Hollinger, 2011). However, international organization such as WHO and UNESCO recommends the adoption of standardized instruments and techniques when assessing children with disabilities. The standardized assessment instruments are essential since, they demonstrate validity and reliability, (Carmines and Zeller, 1976; Messick, 1995). In addition, standardized instruments ensures that the assessments are unbiased, thereby yield effective results (WHO, 2011; DeVellis, 2017). Another recommendation is the use of assessment instruments that are culturally responsive and sensitive to diverse backgrounds of learners with disabilities, (Ebersold, et.al, 2011). These recommendations provide a robust philosophy for developing an effective Learning media assessment instrument for learners with disabilities.

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2.3 Description of Learning Medium Assessment

Family Connect, (2021) defines (LMA) as an instrument that is used to assess senses that a child uses most to obtain information from the environment. (Willings, 2020; Holbrook et. al 2017; Koenig and Holbrook, 1995; Spungin et.al, 2016) define LMA as a systematic way of collecting information about sensory preferences, learning environments, interventional materials, and methods. This definition has four key elements that describe the LMA instrument. These elements include sensory preferences, learning environments, interventional materials, and methodologies. A child uses sense of sight, hearing, touch, or a test to get information around him. This indicates that LMA is an integral part of making decisions on what kind of teaching and learning resources, teaching methods, and literacy materials such as whether to use Braille, Large print, or normal print for learners with visual impairment. Furthermore, LMA helps a teacher to find out which senses a child mostly uses when learning and accessing literacy materials.

In addition, the LMA process for academic learning also includes the collection of data to document reading rates, reading accuracy, reading comprehension, reading fluency, and reading efficiency, (Holbrook, et.al, 2017; Koenig and Halbrook 2017; Spungin et.al, 2016). Furthermore, LMA helps to collect data on learners who are large print readers. Therefore, LMA is connected to inclusive education in such a way that some of the pillars of inclusion and the data which is gathered through the LMA are correlated. Abbott (2007) outlined the following multi-sensory approaches like the use of preferred learning approaches such as auditory or visual; and alternative communication skills. In addition, LMA increases the participation of learners during lessons and other school activities.

In an inclusive educational setting, teachers design their lessons or activities with a consideration of the learning media of individual learners. The development of Learning Media Assessment instruments is, therefore, indispensable as far as inclusive education is concerned.

LMA is considered to be an unbiased process of systematically selecting learning and literacy media for learners with visual impairment regardless of the level of vision or

severity of the actual disabilities, (Koenig and Holbrook. 1995). The aim of the LMA development will help teachers systematically collect data about learners with visual impairment and how they use their senses to read and/or write effectively with print, Braille, or Auditory information, (Ferrer et. al, 2014; Holbrook et. al 2017; Koenig, 1995). The LMA process is also regarded as an instrument that helps collect data on learners' reading rates, reading accuracy, reading comprehension, reading fluency, and reading proficiency, (Holbrook et. al 2017; Koenig and Holbrook, 1995; Spungin et.al, 2016).

Firstly, sensory channels refer to the various ways that individuals receive and process information from the environment, (Kolb, 1984). Thus, LMA gathers data on sensory preferences of an individual learner, (Koenig 1995). For instance, it determines where an individual mostly likes to learn best using sight, hearing, touch, or other senses.

Secondly, it gathers information on learning environments, such as the preferences of individual learners on different illumination levels of a classroom. In addition, it helps to gather information on the physical environment which is represented by different accessibility and use of assistive devices.

Interventional materials such as Braille, large print, normal print, embossed diagrams, raised diagrams, colored diagrams, and pictures. It gathers information on the appropriate teaching methods and teaching strategies.

Furthermore, the LMA instrument is used for assessing children with disabilities especially those with Visual impairment, Deaf blindness, and Multiple Disabilities with Visual Impairment (MDVI), for the selection of appropriate learning media, (IDEA, 2004; Ferrell et.al, 2014; Corn and Erin, 2010; Bell, et al, 2013). The instrument determines what kind of literacy and functional materials are appropriate for those learners to excel in the education, (family-connect, 2012). Intrinsically, the instrument helps to resolve the learners' reading and writing skills, by establishing appropriate reading and writing medium. Thus, helps establish the accommodation and modification needed for learners with later disabilities to progress in general education, (Corn and Erin, 2010; Lueck, 2004).

There is an assumption that every learner with visual impairment needs braille or large print, (Ngung'u, 2011). This assumption is false at one point or another. The LMA is designed to disprove the notion. For instance, Teachers or some stakeholders may prescribe learners with tunnel vision, as well as those with peripheral vision to go for a large print. This is not true because learners with those conditions may not always need large print. The learners can be prescribed normal size print such as N12 and sometimes they may need even smaller font than the N12 for them to fixate well.

However, Sharpe and McNeal, (1995), and Ngung'u (2011) argue that in most parts of the world, the choice of appropriate learning media instrument has "informal" measures and not empirically based assessment tools. They further argue that it remains a challenge in most parts of the world. A more robust solution to the challenge is the use of a psychometrically, and culturally appropriate instrument to assess the learning media of learners with visual impairment.

The LMA assesses a learner's learning style. In other words, the instrument helps to assess the way one uses sensory channels, such as vision, tactile, and auditory. This helps the learners gain access to information through vision, touch, hearing, and other senses, either one way or a combination.

The LMA measure is a continuous process; it should start as early as 3 years. It is also important in transitioning from preschool to primary schools and also from one level to another level in primary schools. It should be updated annually. In addition, it should be conducted when visual functioning changes. Thus, LMA can be used academically for learners who are in the mainstream education curriculum and proceeding along an academic track. However, it should also be used with children with more complex disabilities in looking at functional literacy. The primary reason to perform a Learning Media Assessment is to ensure that all children have access to literacy and education. In this regard, the development of this kind of instrument is essential.

2.4 Theoretical Framework of Learning Medium Assessment

The LMA offers a framework and guidance to teachers and stakeholders about the selection of appropriate media for individual learners, (Cushman, 2010). Thus, learning selection of media assessment is "an objective process systematically determines learning media and literacy. This assessment process guides the educational team in deciding on the total range of instructional media needed to facilitate learning", (Rosenblum et.al, 2021).

The literature shows that most developers of Learning Media Assessment (LMA) instruments, based their constructs on the LMA framework developed by Koenig 1995, which is supported by Holbrook, (McKenzie, 2007; McKenzie, 2005; Lusk and Corn, 2006a; Cone and Ewrine, 2010; Bruce et.al, 2013; Rosenblum and Amato, 2004; Rosenblum, et.al, 2021: Holbrook et.al, 2017; Cushman,2010). The LMA framework developed by Koenig is comprised of several stages which include, determining the use of sensory channels, specifying general learning media, selecting literacy media, and selection of initial literacy media where learners begin formal literacy instruction, (Koenig and Holbrook, 1995).

The use of sensory channels is one of the stages that help to determine the LMA of an individual learner, (Bell, Ewen and Minol, 2013; Koenig and Holbrook, 1995; IDEA, 2004). In other words, it is a process in the LMA, where the use of sensory channels of individual learners is defined. Thus, the sensory channel assessment is conducted to obtain that information. In this case, the assessor judges whether an individual learner uses either sense of vision, hearing, or touch when accessing information from the environment, (Koenig, 1995). The items to obtain information on the use of the sensory channels are based on observable behaviors from several activities at the playground as well as activities in the classroom whereby the assessor is supposed to record whether the learner is using visual, tactile, or auditory sensory channels.

The sensory channel assessment instrument assesses the basic learning modalities which include auditory, tactile, and visual learning styles, Where *V* stands for vision, *T* stands for tactile, and *A* stands for Auditory sensory channel. (Holbrook and Koenig 1998; Bruce et

al, 2013). However, the validity and reliability of some items in the "*The use of sensory channels*" tool may not apply to the Malawian context. For instance, the language used, the observable activities and the materials used in the constructs of the items are relatively different from Malawian contexts. Specifically, items like "*respond to cymbal"* and *"banged cymbals*" contain language that may not be understood by many Malawian teachers. In addition*, Crawl to the mother"* may not apply to a school-going age child in Malawi unless the child has other additional disabilities. This poses a threat to validity. It is argued that developing items using specific context vocabulary that is unfamiliar may increase the difficulty of the item and pose a threat to item validity, (Mullis and Martin, 2013; DeVellis, 2017).

Specific general learning media is the second stage of Koenig LMA framework, (Koenig, 1995). The general learning media encompasses both materials used such as pictures, real objects, and globes; and the methods used such as physical prompting and demonstrations, (Koenig and Holbrook, 1995). The items at this stage are based on the use of sensory channels when different teaching methods and teaching and learning materials are used.
Selecting literacy media is another stage for the LMA framework developed by Koenig. The information to determine Literacy is gathered through systematic observation. This depends on sensory preferences to select materials used for educational tasks, (Koenig, 1995). The constructs for this stage are grounded on the characteristics of the learner, whether the learner can read normal print, large print, or Braille, (Koenig and Holbrook, 1989; Koenig and Holbrook 1995). Figure 1. shows the composition of the LMA developed by Koenig.

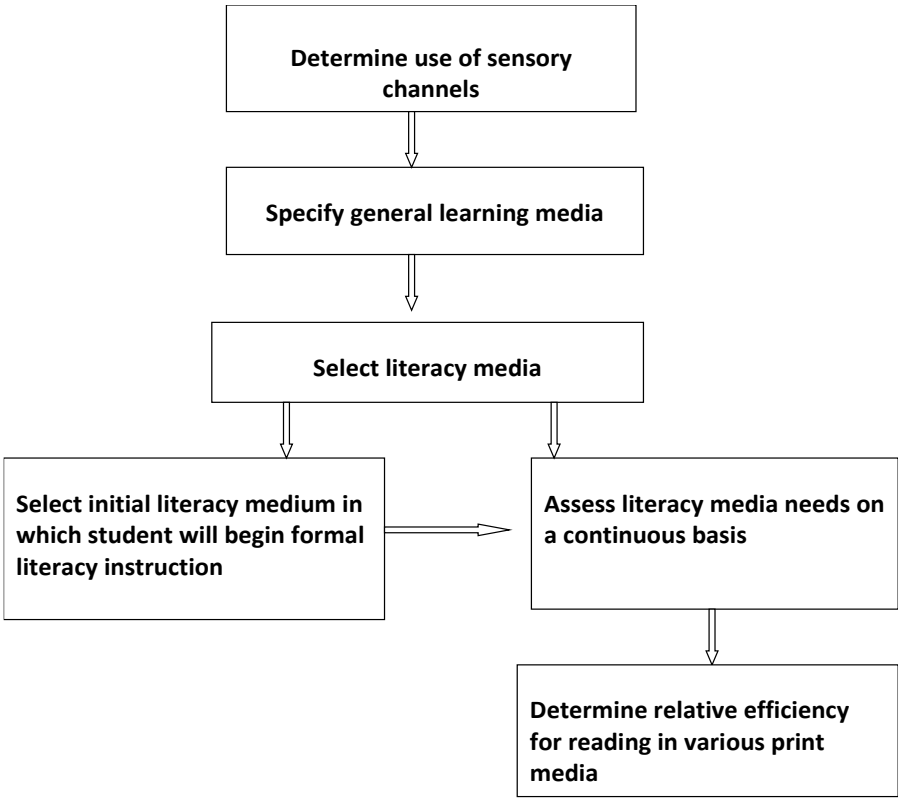

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Figure 1: LMA Framework

Source: Koenig, 1995

2. 5 Learning Media Assessment: Internationally

Many countries in the West have adopted the use of LMA to determine the learning media of individual learners, (Cushman, 2010). Bruce et al, 2003). For instance, the United Kingdom does have LMA instruments. However, their LMA instrument was updated and adapted to their context. This was designed to help qualified teachers for the visually impaired and the team surrounding the child to make informed and data-driven decisions about the learning media and literacy, (RNIB, 2021). The aim was to provide a structured framework to record, evidence, and justify decisions about the choices of learning media for learners with visual impairment, (Koenig, 1995).

The UK-based LMA is in two phases, Phase I is the initial selection of learning and media, and Phase II continuing assessment of learning media which is done annually or once the

vision changes. As shown in the diagram below: The results of this study raise several considerations for teachers as they reflect on the procedures, instruments, and materials they use in the LMA process. Teachers are encouraged to review regularly the instruments and forms they use during the LMA process. As part of this review, they should consider whether sensory channel observations need to be conducted for each learner across time. Data from the sensory channel observation should guide the LMA process, including what instruments and materials are used. Teachers are cautioned that their LMA report should include more than just sensory channel observation data because the LMA process looks beyond personal sensory preference.

Objective data needs to be collected as part of the LMA process to determine whether the learners' preferred sensory channels are their most efficient literacy modalities. Teachers should consider using their resources, along with published instruments, as part of the LMA process so they can ensure they are addressing the full array of literacy options available to different learners with visual impairments. The currently published instruments tend to focus on traditional literacy options and do not adequately address digital options or alternative and augmentative communication systems.

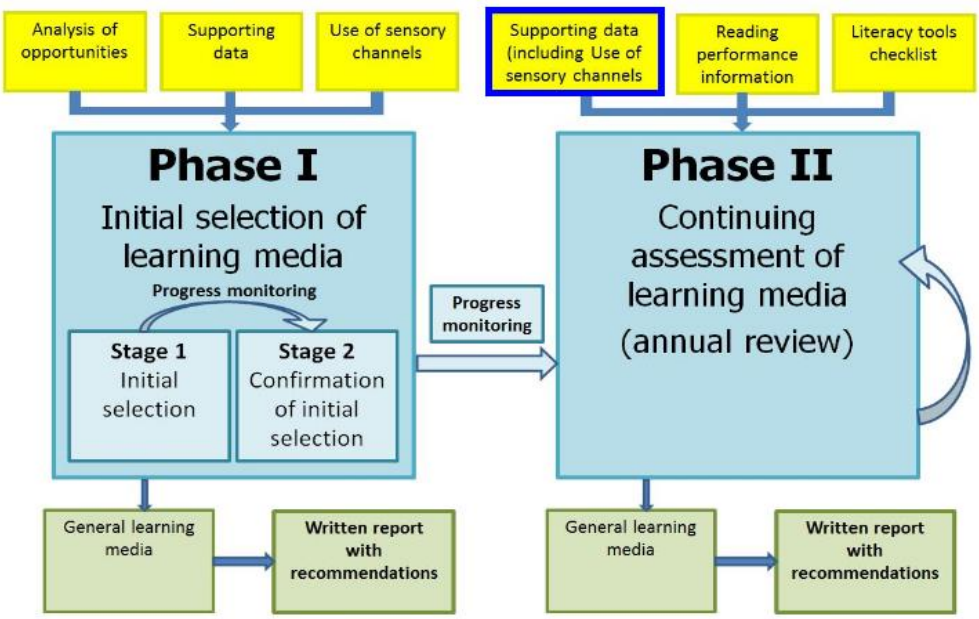

***Figure 2: UK Based LMA Framework*(Source: RNIB,2021)**

Hence the challenge remains in most of the world. As Koenig and Holbrook (1991: p.203), aptly put it “there is no magic recipe for determining the best reading and writing medium for learners with visual impairments”. However, Jennings (1999) expostulated the need to apply a flexible approach in which Braille and print are valued equally. The basic issue for all those involved in education for learners with low vision is to make informed decisions on the appropriate reading and writing medium.

2.6 Other related studies on LMA

There are limited studies that were conducted on the development of Learning Media Assessment instrument. However, other related studies have been conducted over the years.

Kaiser et.al (2017), conducted a study on the analysis of data collecting tools used in functional vision assessment, 39 instruments were examined. Their findings indicated that 80% of the tools assessed variables, such as near visual acuity, distance visual acuity and colour perception. This means that variables which were used in those instruments are reliable. The reliability of an instrument provides the stability and consistency to the measurement it produces, (DeVellis, 2016). On the other hand, the findings on study also reveals that 20% of tools incorporated orientation and Mobility and clinical low vision assessments. (Kaiser, et.al, 2017). This indicates that the difference brings inconsistencies in the inferences. If there is inconsistence of inferences among instruments that claim to measure the same construct, is a threat to psychometry (Messick, 1989).

The survey which was conducted in Canada revealed that 50% of 233 teachers of learners with visual impairments who participated used standardized instruments regarding the processes and materials used to complete Functional Vision Assessment, while the other 50% of the participants said they used tools that they had created, (Shaw et al., 2009). This means that 50% of teachers did not use standardized instruments to assess functional vision which also is an element of Learning Media assessment. Functional vision assessments, which are not standardized, must be considered unreliable because different teachers can obtain different results on the same learner.

Nevertheless, in the same survey, it was reported that 90% of the participants supported the impression that a standardized instrument would be helpful as long as it could be adapted to specific learners (Shaw et al., 2009). It was also clear that teachers were seeking direction or consistency since 96% indicated that they would use a tool that provided more guidance in the FVA process. The rating scales of the instruments used by some teachers of learners with visual impairments in the assessment process to determine recommendations for services and programming based on specific individual needs and characteristics including functional vision (Pogrund et al., 2015). Thus, endorsement of the appropriate learning media can also be obtained.

Another study on the standardized instruments to assess functional vision revealed that 59% of teachers who participated used one or more Severity rating scales as part of the Functional Vision Assessment, (Kaiser and Herzberg, 2017). While 34.5 % of participants reported that they use the Michigan Department of Education's Vision Services Severity Rating Scale (VSSRS; 2013), and 6.5% reported that they use the Visual Impairment Scale of Service Intensity of Texas (VISSIT). Service Intensity Subcommittee of the Texas Action Committee for the Education of Learners with Visual Impairments confirmed the results. However, the authors did not confirm results because the data suggest that some participants use more than one severity rating scale as part of their assessments (Kaiser and Herzberg, 2017). This indicates that the use of standardized instruments is vital when conducting an assessment because it brings stability among different raters. But when there are different ratings, it poses confusion among the rater. This brings a gap in the psychometric properties.

The validity of the instruments above was validated using experts. In this case, they used teachers of learners with visual impairment as experts. Surucu and Maslakcl (2020) argue that qualified experts are crucial for the results to be consistent and unbiased. For instance, VISSIT was evaluated using an electronic questionnaire using 25 "expert" teachers of learners with visual impairments (Pogrund et al., 2015). Moderate validity was established since 71% of the participants reported that the results of the rating scale were aligned with their professional judgment regarding recommended service time (Pogrund et al., 2015).

Similarly, the Michigan VSSRS was found to be moderately valid through an electronic survey of 65 professionals (Wall Emerson and Anderson, 2013). Surucu and Maslakcl (2020) suggested that researchers/instrument developers should choose experts with extensive knowledge of the measurement that is intended to be developed.

However, different areas have their way of rating the measurement of an instrument. Malawi as a nation does not have its ratings on the measurement of instruments that assess the functional vision which is part of the learning media of learners with visual Impairment. It is done in fragmented ways, for instance, on one hand, some do the functional assessment using the outline in the Functional Vision assessment tool cited by the World Health Organization (WHO) by Jill Keef. On the other hand, some just do it through observation when they suspect a learner. The problem with this kind of assessment is that some elements in functional vision assessment can easily be missed, hence lacking reliability and validity.

2.7 Domain of LMA Instrument

There is adequate evidence in the literature that, the LMA developed by Koenig; the LMA which was developed in the UK, and the Malawian LMA have several common elements that can be incorporated into the development of the new LMA instrument. In the first place, for example, Koenig (1995) identified three critical domains of LMA. These include sensory channels, functional visual assessment, and Literacy media assessment. Secondly, the UK-based LMA also has the following domains: use of sensory channels, and literacy tool checklist which is similar to Literacy media assessment. Even though there is no psychometrically proven Malawian way of determining the Learning media of a learner, it has the elements of sensory channel assessment and literacy media assessment. In this regard, it can be singled out that the major domains of the LMA instrument include Sensory channel assessment, functional vision assessment, and literacy media assessment.

2.7.1 Sensory channel assessment domain

The first step for learning and acquisition of knowledge occurs through sensory input, (Smith, 2005). It is a crucial element in how learners with disabilities such as those with

visual impairment as well as those with deafblindness acquire information from the environment for academic purposes. Many educational practitioners and researchers approve that, if a learner is placed in optimal sensory contact with appropriate instructional materials, methods, and strategies, then the individual learner learns at his or her maximum rate of speed, (Lin and Kabina. JR, 2005; Bruce, et.al, 2013; Kalin and McAvoy, 1973; Worthern, 2010; Steeley; 2018). This implies that the significance of matching the use of sensory channels and learning is critical. Subsequently, the use of sensory information of learners is used in the diagnostic teaching and learning, (Koenig and Holbrook, 2007). Many Educational Practitioners such as Head teachers Mainstream Teachers and some specialist teachers face problems in determining which instructional approach, teaching strategies, methods, and materials are appropriate to a particular learner with disabilities in an inclusive educational setting. It is, therefore, necessary to operationally define the sensory channel preferences of those learners to improve Inclusive Education. The sensory channel assessment provides data on those preferences as well as sensory modalities that a learner uses during the learning process.

The sensory channel assessment is the domain in LMA, (Koenig and Holbrook, 1995). Willing's, (2020) also argues that LMA provides valuable information on the learners' use of the preferred sensory channels to promote that learning. This warrants that, the constructs of sensory channel assessment items are essential in the development of the LMA instrument.

The constructs from Sensory Channel Assessment as a domain in LMA, allow teachers to systematically and objectively gather data about learners' use of sensory channels and efficiency with print, Braille, or auditory information (Ferrell et al., 2014; Holbrook et al., 2017; Koenig and Holbrook, 1995; Bell, Ewell and Minor, 2013). This implies that the new LMA instrument will encompass items derived from the sensory channel assessment domain.

Literature shows that the constructs for sensory channel assessment tools have items on the sensory modalities, derived from sensory inputs such as hearing, visual, and tactile. (Ferrell, et.al, 2014; Emmons and Anderson, 2005).

2.7.1.1 Auditory assessment

Hearing sense also known as auditory sense, is a useful sensory channel during the learning process for Learners with disabilities, especially those deprived of sense of sight. Several instruments measure the auditory sense, such as n. Auditory assessment provides necessary information regarding the nature and degree of hearing, auditory perception skills, and abilities, (Center for the Deaf and Hard of Hearing, 2019). Auditory discrimination Thus items on auditory

2.7.1.2 Visual assessment

Vision is an essential aspect of learners with visual impairment especially those with Low vision. According to the World Health Organization, a person with low vision is one who has impairment of visual functioning, even after treatment or standard refractive error, and has a visual acuity of less than 6/18 to light perception or a visual field of fewer than 20 degrees from point of fixation but who are potentially able to use vision for planning and execution of tasks, (WHO, 1995).

2.7.1.3 Tactile assessment

Learners with decreased vision and lack of depth perception, create greater perceptual uncertainty and affect hand-eye coordination and balance required for daily routines, sports, and hobbies (Ekberg, Rosander, von Hofsten, Olsson, Soska, and Adolph, 2013). Thus, they also learn best with an active hands-on approach, (Halbrook and Koenig, 2000; Salleh and Mohd Ali, 2010).

2.7.2 Functional Vision Assessment Domain

Functional Vision Assessment is also an element of LMA, (Koenig,1995). Functional vision assessment is defined as an estimate of how a learner is using his or her remaining vision and to establish the accommodations and modifications, including the use of low-

vision devices and technology, needed for the learner to progress in the general education curriculum. (Corn and Erin, 2010; Lueck, 2004). The survey which was conducted in the United States of America and Canada, indicated that several areas need to be assessed when conducting Functional Vision assessment, (Kaiser and Herzberg, 2017). 314 individual teachers were involved, and their responses on the areas that were assessed were as follows: near visual acuity (*n* = 309, 98%); distance visual acuity (*n = 307, 96%*), tracking (*n = 298, 95%*), Peripheral visual field (*n = 296, 94 %*), (Kaiser and Herzberg, 2017). This is an indication that items in the functional visual assessment domain should have components like both near and distance visual acuity, visual field, and tracking. In addition, Jill Keef (WHO, 1998) outlined some elements that need to be assessed when conducting functional vision assessment. These include fixation, contrast, and environment.

2.7.2.1Visual acuity

Visual acuity refers to the ability to discriminate fine details of the visual scene. it is a measure of the ability of the eye to distinguish the details of the object, such font size of alphabetical letters when reading. According to WHO (2018), the measurement of acuity is made relative to the ability of the normal population to distinguish letters at 6 meters. The International Classification of Diseases classifies visual acuity into two categories, distance and near visual acuity (World Health Organization, 2018). The information about distance and near visual acuity is important because it helps to establish what learning media is appropriate for a particular learner. For example, a teacher uses a chalkboard when teaching.

Thus, the new instrument should include items on both the thresholds of distance and near visual acuity is essential. According to WHO, the normal visual acuity is 6/6, while 6/18 up to no light perception is regarded as visual impairment.

2.7.2.2 Visual field

The visual field is the potion of space in which objects are visible at the same moment during steady fixation of gaze in one direction, (Walker. et. al, 1990). According to the

World Health Organization, anyone with a visual field of less than 20 degrees is considered to be a person with low vision, for example, persons with peripheral vision and those with central or tunnel vision. Thus, information on the visual field is essential when determining the learning media of learners. For instance, if a learner has tunnel vision, it is advisable to recommend normal print or smaller rather than large print. This is so because, within a single gaze, the learner can easily accommodate more letters or words. Hence improve on reading speed.

2.7.2.3 Color contrast

Color contrast is vital for negotiating the world for people with low vision, (Bright et, el, 1997). This is the same with learners with visual impairment. They sometimes have difficulties seeing or differentiating colors. Perception by the human eye requires being able to assess the visual contrast between adjacent surfaces or edges of material objects and judge distances. This function is one of two distinct systems in human vision, a fast, contour-extracting system (Ramachandran *et al*, 1998). Contrast is now included in guidelines for accessibility for the design of environments, products, and services for people with visual challenges, (The Disability Discrimination Act (DDA). This indicates that information on colour contrast is also a vital construct in the development of the LMA instrument. This is so because LMA gives a basis on what colors should be used when developing teaching and learning aids, and also what color contract should be used when preparing print media for a particular learner. For instance, other learners see better when a black background is used against white. While others see better when a green background is against black.

2.7.2.4 Tracking

Tracking is the ability to move eyes smoothly across or within a page from one line of text to another. It is also the following of the text lines by moving the eye or head, (WHO, 95.). Sometimes this can cause problems such as eye fatigue, word omission, and reversal of words Thus; these can negatively impact reading comprehension. Therefore, items on track are vital in the development of the Learning media assessment instrument. This is so because the data collected from those items will give clues on alternative learning media,

for instance, if a learner always fails to track letters or words when reading and writing, then a teacher can have alternative teaching strategies as well as providing teaching and learning materials.

2.7.2.5 Environment

The environment is an aspect that needs to be considered when conducting a functional vision assessment, (Keef, 1994). The environment includes the amount of natural light and the distance of things such as buildings, rivers, and mountains. Changes in the environment can affect vision. For instance, one can move from the building to an outside environment or vice versa a learner can experience hardship in seeing or doing visual tasks.

2.7.3 Literacy media assessment domain

The developers of LMA recognize that literacy is part of the overall umbrella of learning media assessment, (Koenig and Holbrook, 1995; Bruce et.al, 2016; Wilkinson et. al, 2001). Literacy refers to the ability to read and write at a level where individuals can effectively understand and use written communication, (Watson et al., 2004; UNESCO, 2004, 2017). Koenig 1995 recommends that learners with visual impairment should be directly exposed to literacy materials that they can use in their reading and writing mechanism, (Bruce et. al, 2016). The literacy media assessment is consequently crucial when selecting appropriate print media or Braille for learners with disabilities, especially those with visual impairment.

Educational materials get smaller and smaller, as learners progress from one grade level to another, thus, impacting the text's readability, (Schles and Gosnell, 2023). Schles and Gosnell, (2023) explain that LMA is the critical source of data which schools or some stakeholders use to determine the best way each learner can access classroom literacy for educational equity. Readability is part of accessibility which should be considered in the development of the LMA instrument. Font size is considered as one of the construct that can be included in the literacy media assessment tools. In the first place, an objective measure of reading skill helps to prevent a subjective preference for a certain size of print.

This establishes that the size of the print is the construct that can be included in the development of the new LMA.

Literacy media Assessment also focuses on evaluating how different media formats support literacy development, (Sturm and Hines, 2009). This shows that items on literacy formats need to be considered in the development of the LMA instrument. So items on the effectiveness of various media and materials such as Braille and Large print are essential. Koenig (1995), for example, explains that a person with visual impairment achieves full equitable assimilation into a society that is dominated by print materials as an initial communication skill.

Reading rates and reading grade levels are other parts that are used to determine Literacy media, (Corn and Koenig, 2000). This helps to determine whether the learner reads with sufficient efficiency to perform academic tasks successfully, for example:

- Academic achievement determines whether or not the learner is making academic progress in the current medium.
- Handwriting skills, determine whether or not the learner can read his or her handwriting and whether or not the handwriting is legible to others
- The effectiveness of the learner's existing collection of literacy tools, determines whether instruction is needed in additional literacy tools to meet current or future literacy needs.

Diagnostic teaching allows for ongoing assessment of the appropriateness of the initial decision about literacy. If a learner is not making adequate progress, the educational team might consider adding supplementary literacy tools or changing the primary literacy medium. Additional instruction may be needed in new methods or the use of new materials. Diagnostic teaching will continue to evaluate the learner's efficiency with literacy tasks.
Perception is another characteristic that needs to be considered in Literacy attainment. Richardson (2008), defined perception as the way sensory stimuli is organized, interpreted, and experienced. It is the ability to see, hear, or become aware of something through the

senses. This gives meaning to what has been seen or heard. That is, to know what objects or symbols are through matching or sorting and discriminating.

2.8 Characteristics of learners with visual impairment.

Corn and Lusk (2010), uphold that individuals with VI have measurable vision, yet experience difficulties accomplishing visual tasks even with the use of refractive correction. They also argue that individuals with VI are sometimes capable of enhancing their abilities to accomplish visual tasks with the use of compensatory low vision aids or environmental adjustments. Similarly, learners with visual Impairment are also capable of accomplishing visual tasks.

However, Learners with visual impairments lack opportunities for incidental learning that occurs with their sighted peers almost constantly (Hatlen and Curry, 1987 in Penney and Cox, 2001). The limited nature of visuals has an implication on their education due to the absence of reduced visual signals. As such they have difficulties seeing properly work written on the chalkboard or seeing the clock. This can prevent these learners from following classroom procedures or anticipating coming events. Learners need opportunities to become acquainted with their classmates. As learners with visual impairments may not readily associate names and faces through incidental classroom experiences, teachers need to design appropriate experiences to help build relationships among all learners in a class. This can be materialized when the teachers can determine the learning media of these learners.

Literature and the LMA framework show that there is a gap in Malawi's way of assessing learners with disabilities. The current literature lacks detailed information on the assessment of learners with visual impairment in Malawi, (Kaphle, Marasini, Kalua, Reading, and Naidoo, 2015). In this case, the structural or factorial validity is absent because other domains of learning media are missing According to De Souza et.al (2017) structural or factorial validity assesses if one measure captures the hypothetical domain of a construct. This shows that there is a lack of psychometric properties in the LMA instruments that are used in Malawi. Furthermore, there are few culturally appropriate

developmental assessment tools available for children with disabilities in developing countries, Malawi inclusive, (Gladstone et al, 2010). They further argue that, often tools from the West provide misleading findings in different cultural settings, where some items are unfamiliar and reference values are different from those of Western populations. This also poses a gap in the validity and reliability of the LMA instrument.

2.9 Psychometric properties of measurement in the development of Instruments

Since Malawi has limited psychometrical approaches in the assessment of learning media of learners with disabilities, there is a need to develop a local and appropriate Learning media assessment instrument. Developers of LMA assessment instruments and other developers of any assessment instruments recommend the use of psychometric properties of measurement, (Janus and afford (2007) state that the good quality of an assessment instrument depends on Validity and Reliability. Therefore, the development of the LMA instrument should have psychometric properties so that it can be reliable and valid.

2.9.1 Validity

Validity is a critical aspect that is needed in the development of an assessment instrument. The concept of Validity has evolved quite for a long time. And various definitions of validity have been proposed (Borsboom, Mellenberg and Heerden, 2004). A better definition reflecting the most contemporary perspective is that validity is the degree to which evidence and theory support the interpretation of test scores entailed by the proposed uses of the test, (AERA, APA, and NCME, 1999, pg.9). validity refers to whether the measuring instrument measures the behaviour or quality it is intended to measure and is a measure of how well the measurement performs its function, (Whiston, 2012). Different types of validity have been suggested in the literature, (Oluwatayo, 2012). This includes content validity, construct validity, face validity, and criterion-referenced validity. However, criterion-referenced validity was not used in this study because there was instrument was developed from scratch.

2.9.1.1 Content Validity

Content validity is defined as the degree to which elements of an instrument are relevant and represent targeted constructs of a particular assessment (Cook and Beckman, 2006; Polit and Beck' 2004; Bollen, 1989). The elements of an assessment instrument refer to all aspects of the measurement process that can affect the data.

It is used in scale development or adaptation of the developed scale for the relevant culture and language to provide the determination of the most appropriate expressions to improve the quality of the expressions in the measuring instrument and to serve the purpose of the scale, (Surrucci and Maslakci, 2020).

Content validity of a measuring instrument thus, is a type of validity that reveals the extent to which each item in the measuring instrument serves the purpose of the whole instrument. Content validity used in scale development or adaptation of the developed scale for the relevant culture and language provides the determination of the most appropriate expressions to improve the quality of the expressions in the measuring instrument and to serve the purpose of the scale, (Surrucci and Maslakci, 2020).

Content validity ensures that there is a useful scale in the content that serves the purpose of developing that particular measuring instrument to measure any behaviour or quality. However, in the field of social sciences, in particular, the content area of many concepts used is unclear. Therefore, there is no consensus in the literature regarding the definitions and content of most concepts. Researchers who use content validity studies must develop a theoretical definition of the relevant concept and determine the content (domains) of that concept.

There are several methods have been proposed for determining content validity, (Surrucci and Maslakci, 2020). The methods include taking expert opinions and statistical methods. These two methods are the most frequently applied methods to obtain content validity. In the first place, the opinion of experts is to obtain content validity. This is a process that transforms qualitative studies based on expert opinions into quantitative statistical studies

(Yeşilyurt and Çapraz, 2018). In this method, the researcher consults the experts to evaluate each expression in the developed measuring instrument. Thus, the experts evaluate based on the appropriateness of the content of the scale as well as evaluate each expression matched with the opinions of the experts (Rubio et al., 2003). The objective results are obtained by calculations. This determines the content validity. The number of experts is significantly importance in the development of an instrument because it helps to have a quality instrument, (Ayre and Scally, 2014). Qualified experts are crucial for the results to be consistent and unbiased. Therefore, care should be taken when choosing experts, and academicians or practitioners with extensive knowledge should be preferred for the measuring instrument that is intended to be developed.

The opinion from experts is transformed into a statistical analysis. Content Validity Ratio (CVR) is the statistical measure that is used to determine content validity in the development of instruments, (Lynn, 1986). It helps to determine whether the items in the measuring instrument should be added to the scale/ instrument or not The CVR was originally developed by Lawshe in 1975, (Zamanzadeh et.al, 2015). It is calculated according to the below formula (Lawshe, 1975):

$$CVR = \frac{N_e}{\frac{N}{2}} - 1 \quad \text{or} \quad CVR = \frac{N_e - \frac{N}{2}}{\frac{N}{2}}$$

Expressions in the formula denote:

CVR = Content Validity Ratio

N= Total number of experts evaluating items in the measuring instrument.

Ne = Number of experts evaluating the relevant item as appropriate.

Lawshe (1975), further states that each statement in the pool of items developed is presented to experts to obtain their opinions. Experts score these statements using different types of Likert scales for example, the statements can be rated using "Appropriate", "Appropriate but should be corrected" and "Subtracted" or using a 5point scale like strongly agree, agree, neither agree nor disagree, disagree, and strongly disagree.

Yeşilyurt and Çapraz, (2018) explain that the results can be interpreted as follows:

- *If the CRV = 0 that means half of the experts express their opinion on the statement in the measuring instrument as 'Appropriate';*
- *If CVR = > 0 then more than half of experts indicated "Appropriate"; and*
- *If CRV = <0 then less than half of the experts indicated "Appropriate".*
- *If the CVR is 0 (zero) or negative, that expression must be subtracted from the measuring instrument.*

Furthermore, Item Content Validity Index (I-CVI) is an extension and refinement of CVR, (Polit and Berk, 2006). Its critical values is used to determine the minimum CVR value required for an item to be considered as having acceptable content validity at a significant level of $p< .05$, (Wilson et.al, 2012).The I-CVI ensures that items are relevant to the construct being measured, (Polit and Berk, 2006). It is calculated using the formula below:

$$I - CVI = \frac{n\ (3or4)}{N}$$

Where :

n(3or4) = number of Experts rating the item

N = Total number of Experts

The interpretation guide lines include the following;

- If the I-CVI = 1.00, then all Experts rated the item 3or 4. This indicates perfect on the item relevance
- If the I-CVI ≥ 0.78, is the commonly accepted threshold indicating acceptable content validity when the number of Experts is more than six.
- If the I-CVI ≤ 0.78 indicates that the proportion of Experts consider the to be relevant. The item can be revised or removed.

In short, the I-CVI interpretation depends on the number of Experts. The fewer the Experts, the higher the I-CVI threshold.

The Scale-level Content Validity Index(S-CVI) which is also known Universal Agreement (UA) also an important method on instrument development. It is an average measure of

content validity for the entire items, (Polit and Berk 2006). This method calculates the proportion of items that achieve a perfect I-CVI score. The S-CVI helps to establish whether the items collectively have strong content validity or not.

2.9.1.2 Construct validity

Construct validity refers to how well one translates or transforms a concept, idea, or behavior that constructs it into a functioning and operating reality, the operationalization (Trochim, 2006).

a) Factor analysis

Factor analysis is a predominant technique that uses statistical methods to simplify interrelated measurements to explore patterns in a set of variables, (Fabrigar and Wegner, 2012; Kaplan, 2008; Tabachnick and Fidell, 2013). Factor analysis is an advanced correlational statistical procedure that is used to identify unobserved or latent variables called factors, which are predicted by a theory, (Hale and Astolfi, 2014). They further explain that if the measures possess all the factors and variables cluster as the underlying theory posits, then there is evidence of the theory's construct validity. In the same way, Taylor (2013), states that the development of assessments begins with a set of definitions of the constructs, of the behaviors and tasks that will demonstrate each construct, how those behaviors and tasks will be elicited from examinees, how responses will be scored, and of how scores will be interpreted. These are the logical arguments underlying an assessment. There are two different types of statistical methods. These are Exploratory Factor Analysis (EFA) and confirmatory factor analysis (CFA). (Fabrigar and Wegner, 2012; Kaplan, 2008). Exploratory methods are used to determine the underlying structure of a scale and are useful for 'exploring' the unknown characteristics of a measurement instrument. This analysis allows the researcher to identify the main domains of a relatively sizeable hidden structure represented by several elements (Henson and Roberts, 2006; Swisher et al., 2004). The primary purpose is to examine a large number of expressions related to the structure of the scale, to identify fewer expressions that explain the structure of the scale, and to increase the explanatory power of the scale structure. It is usually performed to reduce the

number of variables observed in scale development studies and to determine what factors it creates.

CFA is a commonly used approach in empirical research. Its primary purpose is to test the accuracy of the previously validated scale or model, (Brown, 2015). According to Valdez (2012), CPA examines the theoretical structure and communality of an assessment. It is conducted using pre-test scales. For instance, if the data set is ordinal, the CFA can be conducted on the polychromous correlation matrices using the weighted least square approach, (Brown, 2015).

However, if the threshold values of the previous scale are not provided, or the structure of the measuring instrument is not verified, then EFA should be conducted. That means the relationship pattern between the expressions and factors in the measuring instrument is explored, and the necessary corrections are made. But, If previous theoretical support is available or if the structure of a scale is known a priori, then the researcher may not need to utilize exploratory methods and may progress to checking the 'fit' of an existing model using CFA, (Fabrigar and Wegner, 2012; Kaplan, 2008; Tabachnick and Fidell, 2013). Whether one is using exploratory or confirmatory methods, the data reduction technique chosen, the analysis of the output, and the interpretation of the model is influenced by the type of construct. Therefore, both EFA and CFA are essential for the development of psychometrically sound measuring instruments depending on the source of the constructs.

b) Data reduction techniques

Construct validity is often explored using data reduction techniques. The most commonly used approach for data reduction is EFA and principal components analysis (PCA) is also commonly used. PCA is often the default data reduction technique in many statistical programs, (Fabrigar and Wegner, 2012; Kaplan, 2008). There is a misperception in the literature regarding the difference between EFA and PCA and whether these two techniques should be used for the same purpose. However, it is important to recognize that EFA and PCA use different underlying mathematical techniques, (Fabrigar and Wegner,

2012). For instance, the PCA technique leads to the generation of components, rather than factors. PCA is a suitable technique when the research aims to reduce the number of variables and it is typically used for data reduction of formative constructs, (Hairs et.al, 2006). Principal component Analysis of rash-generated residual, for example, uncovers domains in the data after the first data is reduction of the constructs. As such, the commonality is supported when the variance is explained by the first domain is > 50 %, (Valdez 2012).

However, Kaplan (2008) argues that PCA is not intended to consider the structure of the correlations among variables, but rather to form a smaller set of measured variables. This means that PCA focuses on the variances of the measured variables rather than the correlations that exist among them. The principal component model allows the researcher to explain the maximum amount of variance by creating 'components' and produces results that are unique to that data set. The components generated from PCA simply represent efficient methods of capturing information in the measured variables, regardless of whether those measured variables represent meaningful latent constructs, (Fabrigar and Wegner, 2012; Kaplan, 2008; Tabachnick and Fidell, 2013). PCA produces constructs that are formative, as such, the model is specific to the data set, and the results are not generalizable to the wider population. PCA may also be used as a diagnostic test, (Fabrigar and Wegner, 2012).

2.9.1.3 Face Validity

Face validity is a subjective judgment on the operationalization of a construct, (Taherdoost, 2014). Face validity is the degree to which a measure appears to be related to a specific construct in the judgment of non-experts, (Hale and Astolfi, 2014). We can relate this with the development of Learning media assessment, that non-experts such as learners with visual impairment, class teachers, or other stakeholders in the field who are not qualified, such as parents of learners with visual impairment. These people can be engaged in the validation of the instrument. An instrument has face validity if its content simply looks relevant to the person taking the test or using the instrument. Face validity is not usually an important psychometric facet of validity. Non-expert opinion has no direct bearing on

the empirical evidence and theoretical quality of an instrument. It is considered to be weak. Even though face validity might not be crucial for test validity, from a psychometric perspective, it has an important implication on its use, (Clark and Watson, 1995). They further explain that the apparent meaning and relevance of test content might influence test takers' motivation to respond seriously and honestly. Therefore, a test or an instrument with high face validity might be much better- acknowledged by test-takers, assessors, and test users, especially the instrument which is developed by considering the epistemological context of a particular country, (Taherdoost, 2014).

Hinkin, Tracey, and Enz (1997) argue that the burden falls on the researcher not only to provide a theoretical definition of content validity accepted by one's peers but also to select indicators that thoroughly cover its domain and domains. One of the commonly used approaches to assessing content validity is to ask several questions about the instrument and ask the opinion of the expert judges in the field.

2.9.2 Reliability

Reliability is defined differently by different researchers for different purposes. Even though there are such disparities among researchers, reliability simply entails how consistent or stable a measuring instrument is. The most commonly used technique to estimate reliability is with a measure of association. (Weiner and The John Hopkins University, 2007), the correlation coefficient which is mostly presented as the reliability coefficient. According to Drost (n.d.), the reliability coefficient is the correlation between two or more variables that measure the same thing. Methods of reliability include the following test-retest reliability, split-half reliability, inter-rater reliability, and internal consistency reliability. These methods address the three main concerns in reliability; equivalence, stability over time, and internal consistency. This study, however, focused on internal reliability.

Internal consistency measures consistency within the instrument and questions how well a set of items measures a particular behavior or characteristic within the test, (Drost, n. d.). It is commonly used in Classical Test Theory (CTT), (Streiner 2003). For a test to be

internally consistent, estimates of reliability are based on the average inter-correlation among the single items within a test. Cronbach alpha is the method widely used for testing internal consistency. The more items you have in the instrument the higher the value of alpha.

Reliability can be improved by writing items, making test instructions easily understood, train the raters effectively by making the rules for scoring as explicit as possible. A satisfactory level of reliability is determined by how the instrument is to be used. Nunnally (1978) suggested that in the early stages of research, the predictors tests of a construct should be reliabilities of 0.07 or higher. Nunnally further argues that increased reliabilities beyond 0.08 are often wasteful of time and funds because correlations at that level are attenuated very little by measurement of error. Obtaining a higher reliability of 0.90, for example, requires strenuous efforts at standardization and probability addition of items.

2.10 Chapter Summary

The chapter provided relevant research and literature on Learning Media Assessments. This includes the general assessment for learners with disabilities where guidelines for effective instrument were discussed. The chapter also discussed LMA frameworks and empirical evidence that lays a foundation of content and constructs of LMA instruments. It also highlighted the psychometric properties of measurement in the development of assessment instruments. The next chapter discusses the methods that were adopted in the development of the instrument and data analysis.

CHAPTER 3

METHODOLOGY

3.1 Chapter overview

The chapter discusses the research design and methodologies that were adopted in the development of the Learning Media Assessment instrument. It presents the theoretical paradigm that guided the choice of research design and methodology. The chapter further describes the sampling strategy, methods that were used to gather data and how the data was analyzed; ethical considerations, and trustworthiness issues.

3.2 Theoretical Paradigm

This study was guided by the philosophical foundation of the pragmatic paradigm. Pragmatism is a philosophical movement that contends that an ideology can be said to be true if only and only if it works satisfactorily, (Creswell, 2012; Johnstone and Christensen, 2012; Bryman and Bell, 2007). This theoretical perspective guides the conduct of mixed methods research. By definition, mixed methods research is a term used to describe research that combines the use of both quantitative and qualitative research methods, (Bryman, 2008). The first qualitative phase of the study worked from a constructivist worldview through which understandings or meanings are formed through the subjective views of participants (Creswell, 2009; Creswell and Plano Clark, 2011). This means that data was collected through interviews and a literature review for an in-depth understanding of the underlying constructs, and contents of the LMA instrument. In the quantitative phase of the research, the worldview was shifted to a postpositivist philosophy by identifying and describing variables quantitatively. This was where data was collected and analyzed statistically to test for validity and reliability. Multiple world viewers were therefore utilized in this study, shifting from a constructivist worldview to a postpositivist worldview when shifting from qualitative data to quantitative data.

3.3 Research Design

This study employed a mixed research design. Tashakkori and Teddlie, (1998) defines mixed research design as a combination of both qualitative and quantitative approaches in the methodology of the study. A mixed methods approach does not only combine methodologies, it also combines a philosophy and research design orientation. As Creswell and Plano Clark (2011) state, both qualitative and quantitative data are collected and analyzed in a mixed methods approach. In a mixed-method study, these procedures are framed within philosophical worldviews and theoretical lenses and combined into specific research designs (Creswell and Plano Clark, 2011). "Its central premise is that the use of quantitative and qualitative approaches, in combination, provides a better understanding of research problems than either approach alone" (Creswell and Plano Clark, 2007). The type of mixed research which was used is the exploratory sequential design. Creswell (2021) explains that exploratory sequential design systematically integrates qualitative and quantitative findings in sequence. The rationale of this approach lies in the exploration of the variables and domains that need to be measured first, (Creswell 2018). That is, qualitative data was collected through interviews and literature review to explore the constructs of items for the developed instrument and also to establish the criteria or structures that constitute a good LMA instrument. Then the results were directed into the next phase of the quantitative phase. As earlier stated, the quantitative phase used statistical methods to test the validity and reliability of the identified items for the developed instrument.

3.4 Description of the Study Area

The study took place in the Shire Highlands Educational Division (SHED) in the southern region of Malawi. This Educational Division has four district education offices namely: Chiradzulu, Thyolo, Mulanje, and Phalombe. Within these districts, there are several resource centers and mainstream schools that accommodate learners with disabilities including learners with visual impairment, deafblind, and MDVI. The population of learners with disabilities who are registered is approximately 227. That is, Chiradzulu has registered 54 learners, and Phalombe has 70 learners from resource centers that are attached to mainstream schools. Thyolo registered 157 and Mulanje has not provided the statistics

of those with disabilities. The study targeted three primary schools within the Division. These school were targeted because they practice inclusive education where learner with disabilities are integrated. This assure that the information obtained from teachers of those schools are valid. In other words, the teachers may have knowledge of the decisions they make on learning media.

3.5 Study Sample and Sampling Method

Purposive sampling was used to sample the target population of this study. Purposive sampling is a non-probability sampling technique where participants are selected based on specific characteristics, (Patton, 2002; Etikan, Mussa and Alkassim, 2016). In this case, criterion-based selection was used to recruit teachers, for instance, the study targeted teachers/specialist teachers who have experience in teaching Learners with disabilities in an inclusive setting. The sample comprised of 33 teachers. While experts were selected according to their expertise and knowledge of LMA instruments and general assessment of learners with disabilities. The population was 5 experts were targeted. Who are specialized in the field of Visual impairment, deafblindness, and multiple disabilities with visual impairment. The 4 stakeholders were selected based on the knowledge that they always collect data concerning the learning media of learners at the School, District, and National levels, respective. This comprised one Officer from MANEB; one Inclusive Education Officer and Two Head-teachers.

3.6 Data Generation and Management

The data was generated using a modification of the MEASURE approach as well as the Benson and Clark phases of developing an instrument. These two approaches were developed to provide the guidelines for developing measuring instruments, (Benson, 1998; DeVellis, 2016; Benson and Clark,1998). The study adjusted the two approaches into four main stages.

The first stage was reviewing the existing literature on learning media assessment and interviewing stakeholders such as specialist teachers to verify existing constructs and to

define the appropriate domains that can be included in the proposed new instrument. This helped to create items as well as the domains that were included in the new instrument.
The second stage was the development of an Item pool. The items were developed by adapting the existing constructs to fit the constructs intended for measurement, based on the empirical evidence from the literature and on the current ways of conduct of conducting LMA in Malawi.

The third stage was the refinement of the instrument. This involved experts who rated the items dichotomously. The ratings were based on the relevance, representativeness, and appropriateness of the items to measure learning media. They scored the items dichotomously by expressing their opinion on the statement in the measuring instrument as "Appropriate or Inappropriate for each item. This helped to generate data for content validity. Teachers were also involved in scoring the items using a Likert scale of point five to generate data for construct validity. That is, a judgmental approach was applied to establish construct validity.

Face validity was done by purposively selected people who were asked to give comments on the general appearance of the LMA instrument and make suggestions. The group consisted of Specialist teachers, Primary School Teachers, Teacher training lecturers, parents, and a Primary educational Advisor (PEA). The data generated helped to make necessary changes such as spelling, and grammar. The instrument was sent to notable experts in the field of visual impairment and deafblind for content validity. The experts gave their detailed analysis of the contents and constructs of the LMA instrument as well as the outlined plan of how the assessment can be carried out. The data was collected and interpreted.

The fourth stage was the verification of the instrument. Data was collected by using teachers and specialist teachers who teach to rate the items for each factor or domain. The Reliabilities of factors were calculated to determine the inter-item constituency of each factor. Items that had decreased reliability of a factor were excluded from the final

instrument. That is, descriptive statistics was performed together with the Cronbach **α** Coefficient.

3.7 Data Generation Instruments

The study used semi-structured interview guides, (*refer to Appendices 6 and 7*), and information from the literature review that is, through books, journals, policy documents, and the Internet. The instrument itself was also used in several stages, for example, to test for content, construct, and criterion-related validity. In addition, the instrument was subjected to a test for reliability.

3.8 Data Analysis and Interpretation

Data analysis used the exploratory sequential design. This started with quantitative data analysis approaches which helped in the development of item pool of the instrument. The results from the qualitative data provide preliminary instrument. In the subsequent phase, quantitative data analysis approaches were used to provide the evidence of the validity and reliability of the LMA instrument.

3.8.1 Qualitative Analysis

The qualitative data was analyzed using framework and content analyses. Gale et.al (2013) defined Framework analysis as a method of analyzing qualitative data where themes and codes are selected based on the literature as well as theories. This included the analysis of in-depth individual interviews and a literature review, (John et.al, 2014; Ritchie and Spencer, 1994). In this case, therefore, relevant literature and theories on Learning Media Assessment, as well as, results from the interview were analyzed. The LMA instrument has many domains, which include sensory channels, and functional visual and literacy media assessments. This helped to develop items and domains that underline the constructs of the LMA instrument.

3.8.2 Quantitative Analysis

The quantitative data analysis involved the provision of evidence of validity and reliability of the LMA instrument.

3.8.2.1 Validity

The validity of the instrument was verified through content validity, construct validity, and face validity.

a) Content validity

First, the content validity of the items was calculated using the Content Validity Ratio (CVI) and Content Validity Index, (CVI) using the SPSS statistical package. This was calculated according to the formula below (Lawshe, 1975):

$$CVR = \frac{N_e}{\frac{N}{2}} - 1 \quad \text{or} \quad CVR = \frac{N_e - \frac{N}{2}}{\frac{N}{2}}$$

Expressions in the formula denote:

CVR = Content Validity Ratio

N= Total number of experts evaluating items in the measuring instrument.

Ne = Number of experts evaluating the relevant item as appropriate.

The interpretation is CVR= 0, if more than half of them state "Appropriate", CVR> 0, and if less than half of the experts' state "Appropriate" then CVR<0. If the CVR is 0 (zero) or negative, that expression must be subtracted from the measuring instrument (Yeşilyurt and Çapraz, 2018).

The relevance content was calculated by using I-CVI and S-CVI to determine the relevance of each item and each domain to the contents of LMA Instruments, respectively. This was interpreted by using the critical value of CVR developed by Lawshe. Items which were below the accepted value for 5 panelists were amended or removed from the item pool.

b) Construct Validity

Factor analysis was used to examine construct validity. Initially, the Kaiser-Meyer-Olkin (KMO) test and Bartlett's test were used to determine whether the data was appropriate for factor analysis. Subsequently, the principal component method of extraction of factors was

selected after comparing the results with the principal axis factoring and the correlation matrix showed little item correlations. After the rotation method was selected, the Kaiser Criterion (eigenvalue >1) and the scree plot graph were used in the investigation to determine the number of factors. The varimax and direct oblimin method of rotation was used. The varimax was finally used because after running the direct oblimin method, the results showed that there was no significant correlation between factors. Lastly, the factor loadings were interpreted and labeled.

The whole process of examining construct validity is depicted in Figure 3.

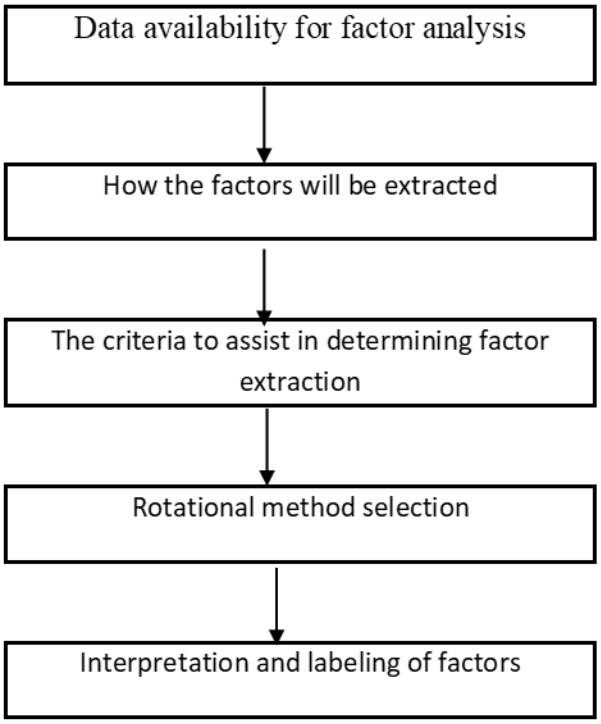

Figure 3: The Steps in the Factor analysis Protocol

c) Why Factor analysis

Factor analysis is a multivariant statistical procedure that has many characteristics, (Field, 2013; Hair, et.al, 2019). This study focused on the four characteristics. Firstly, factor analysis was conducted to reduce a large number of variables into a smaller set of variables. Secondly, it helped to establish underlying domains between measured variables and latent

constructs, thereby allowing the formation and refinement of the LMA instrument. Thirdly, it helped to provide evidence of a self-reporting scale or instrument. Fourthly, it helped to address multi-collinearity.

d) Face validity

Face Validity was conducted by experts who gave comments on the general appearance of the LMA. The Data that was generated helped to make necessary changes such as spelling, and grammar. For content validity, the instrument was sent to notable experts in the field of visual impairment and deafblind from Monfort Special Needs Education College. The experts gave their detailed analysis of the contents of the LMA instrument as well as the outlined plan of how the assessment should be carried out, the type of data to be collected, and how to interpret the scores.

3.8.2.2 Reliability

The reliability of the LMA instrument was done in the domains using the factors extracted when performing factor analysis. Reliabilities of factors as calculated to determine the inter-item constituency of each factor. Items that had decreased reliability of a factor were excluded from the final instrument. Statistics calculations were performed using the Cronbach **α** Coefficient to test the internal consistency of the proposed instrument. The results of an item that was below the significant level of 0.70, those items were removed from the final instrument.

3.9 Ethical Consideration

According to Saunders, Lewis and Thornhill (2016), research ethics are standards of the researcher's behavior in relation to the rights of those who become the subjects of a research project, or who are affected by it. Leady and Ormrod (2015) declare that most of the ethical issues in research fall into following categories: protection from harm voluntary and informed participation, rights of privacy and honesty. In this study, every effort was made to follow the above principles which are in line with the University of Malawi Research Ethical Committee (UNIMAREC) standards and also the Data Privacy Act by the University of Malawi.

3.9.1 Permission

In the study, formal permission was first requested from the University of Malawi Research Ethical Committee (UNIMAREC) before conduct the research. Permission was also requested from the Education division manager, the District Educational Manager and from the Head-teachers of targeted schools where the research was conducted.

3.9.2 Informed Consent

Consent forms approved by the UNIMAREC were being issued to participant prior to conducting the research, (*refer to appendix 1*). Babbie (2001) states that the ethical norms of voluntary participants and no harm to participants should be formalized in the concepts of informed consent. Therefore, the researcher asked for consent from the participants and they were assured that their names remain anonymous. The consent ensures that individuals participating should know all about the research, so that, they can make informed decision on whether to participate or not. It also ensures that the participants were respected and protected.

3.9.3 Confidentiality

The participants were assured of confidentiality to the data that was collected pertaining the study. Babbie, (2001) emphasizes that participant in the research should be given their right to privacy and confidentiality because this develops mutual understanding. As a result, the researcher assured respondents that the information they provided was treated with high confidentiality and privacy.

3.10 Limitations of the Study

Limited availability of research studies on the development of Learning Media Assessment instruments was a challenge. There were limited sources to draw tested knowledge and facts from. For example, there was no blue print available for the development of items for the new LMA instrument. However, the choice of mixed research by using exploratory sequential approach helped to break new grounds by allowing in-depth understanding of constructs and contents of LMA before coming up with items for the instrument without depending much on previous studies. This assertion is supported by Creswell's (2012)

description of exploratory research design, whereby the researcher has the ability to understand an issue more thoroughly, before attempting to quantify responses into statistical inferable data. This helped to reduce research level of biasness.

3.11 Chapter Summary

The chapter has presented positivism as a theoretical paradigm, where both quantitative and qualitative methodologies were used in the study. It has also highlighted purposive sampling and data collection methods such as semi-structured interviews, and literature review. It has also explained that the exploratory sequential design was used for analyzing data, including issues on ethical considerations and limitations of the study. The next chapter discusses research findings.

CHAPTER 4

DISCUSSION OF THE RESULTS

4.1 Chapter overview

The chapter presents results on the development of the LMA instrument for Leaners with Disabilities. This was guided by the following research objectives: to develop item pool for the LMA Instrument; to examine validity and reliability of the new instrument, respectively. The study followed Exploratory Sequential Design data analysis approach whereby qualitative data analysis was used to generated results for the first objective.

4.2 Results for Item Development of LMA

The first objective of this study was comprehended using qualitative data analysis approach in order to generate designs for the development of item pool for the instrument. The data were analyzed using content data analysis method. Krippendorff (2018), defines content data analysis as a systematic and replicable method used for coding and interpreting textual data to identify patterns, themes and meanings. This can be applied to various types of data including, interview transcript, articles, and other written or visual contents. This study therefore, explores the findings on item development created from literature review and interviews.

Initially, the LMA frameworks were examined to identify the main domains for the developed instrument. Both the LMA Instrument developed by Koenig 1995 and UK-based LMA were examined, because many LMA developers use those frameworks as their foundation, (Bruce et.al, 2016; Corn and Lusk, 2010). The literature from books and journals on Learning media assessment were also examined as discussed in Chapter 2. LMA developers such as Dr. Alan Koenig and Dr. M. Cay Holbrook in their publications, "*Learning Media Assessment of Students with Visual Impairment; A Resource Guide for*

Teachers", identified three major components that constitute LMA; Sensory channel, Functional assessment and Literacy media assessment. (Koenig and Halbrook, 1995). Similarly, Cushman, (2010) also outlined that LMA should assess Sensory channels, functional vision and literacy media of children with visual impairment and other disabilities. After scrutiny of the above explanation. three major themes were coded from that process. These themes include sensory channel assessment, functional vision assessment and literacy media assessment. The themes were used to categorize the domains and their items for the development of the new LMA instrument.

4.2.1 Development of Sensory channel Assessment items

Theme 1 introduces to the construction of items for the sensory channel assessment domain. Sensory channel assessment assesses, how learners receive and process information from the environment using the senses, (Cushman, 2010; Bruce et al, 2003). The assessment help teachers to understand how learners with disabilities access educational information using the senses such as, auditory, vision and tactile. Therefore, items on the senses were formulated. For example, items like, "does *the learner able to describe distant objects?"* were developed. In addition, data from the interviews with Teachers were also captured. The teachers were asked the following question, "*How do you determine learning media of learners in your class?"* the response was that they observe the general appearance of the Learners. One Teacher further said,

> *I observe the general appearance of the learner because it helps me identify the best teaching and learning materials. If, the learner does not have a hand for example, I cannot give him or her materials that require manipulation or touch. It can be an insult to that child.*

Based on that information, item like, "*does the child have additional disabilities*," was developed. Furthermore, Teacher's response on same question were as follows:

- *I observe if the Learner is able to see.*
- *I observe if the Learner can respond to voice or sound.*
- *Asking learners if they can see work on the chalkboard.*

Using findings from both the literature review and interviews above, 12 preliminary items were developed for sensory channel assessment, *(refer to appendix 8*).

4.2.2 Development of Functional Vision Assessment items

Theme 2 directed to the development of items for Functional vision assessment domain. Functional vision assessment is an element of LMA which focuses on how learners use their remaining vison in their day to day living, (Kaiser and Herzberg, 2017; Keef, 1989). Literature shows that functional vision assessment assesses Visual acuity, visual field and tracking, (Erin, 2010; Lueck, 2004). Research findings by some researchers also give empirical evidence that FVA features should include Visual acuity, visual field and tracking, (Bruce et. Al, 2016; Erin and Paul, 1996; Gathewel, 2007). This gives an indication that, those features must be part of items for the function Vision assessment. On a similar note, the interviews were held with teachers also revealed that, some teachers especially, those who were specialized in visual impairment and also those in deafblind fields use the Snellen chart to check the visual acuity of learners in order to determine learning media of learners in their class. During the interviews, one of participants responded on the same and he said;

> *I use Snellen chart to observe the visual acuity of learners. This help me to establish where that child's Visual Acuity is below or above 6/18. I also check on whether the child has a visual field of greater or less than 20 degrees.*

Based on the above findings, 11 items were formulated for Functional Vision Assessment, *(refer to Appendix 8).*

4.2.3 Development of Literacy Media Assessment items

Theme 3 led to the formulation of items for Literacy Media Assessment. According to Sturm and Hines (2009), Literacy Media Assessment focuses on evaluating how different media formats and supports Literacy development. It assesses reading medium, size and font of the print medium, reading speed, (Bruce et.al, 2014). Basing on this, items like, "*Items like, Does the learner use braille for writing?"* were created.

In addition, LMA developers such as Dr. Alan Koenig and Dr. M. Cay Holbrook in their publications, "*Learning Media Assessment of Students with Visual Impairment; A Resource Guide for Teachers*" (Koenig and Halbrook, 1995), developed LMA instruments, (*refer to Appendixes 3,4, and 5*). Some of the items for literacy media assessment were adapted from those instruments. For example, items like," *Does the learner demonstrates an association of pictures or stories/book?"* and *"Does the learner recognize action in pictures*?" were developed.

Furthermore, the interviews were held with stakeholders, such as District Inclusive Education Coordinator and head teachers were held, respectively. The interviews were conducted to generate ideas on how they verify their decisions on literacy media of learners, like size of the text in books to purchase; whether the learner need Braille materials or not, or whether the learner should be among those to be considered for adapted or modified exam. It was revealed that they all rely upon information from schools. Similarly, the interviews with head teachers showed that most of them rely on the information provided by Teachers and Specialist Teachers about the literacy media of learners. The information helps them to code learners for MANEB examination purposes. Currently, the code is as follows;

- *Candidates with Blindness (Braille users) = 01*
- *Candidates with low vision = 02*
- *Candidates with Hearing Impairment (HI) = 03*
- *Oral examined candidates = 04*
- *Candidates with other disabilities = 05*

The Braille users' candidates are provided with Braille examination papers. Candidates with Low vision are provided with large print examination papers or optical devices. HI candidates are provided with a sign language Interpreter. While Candidates coded 04 and 05 are provided with special invigilators.

According to MANEB officials, the process of assigning appropriate Literacy media to learners with disabilities or those who require special assistance during examinations; starts

with receiving data from district education offices as well as from schools. Then, they do verification from selected schools by using a sample of different font papers, that is, normal print size and large print size. In this regard, some items for the pool were formulated based on the font of letters. Therefore, a total of 20 items were developed for literacy media assessment.

In summation, the development of items for the new LMA instrument is depicted in Table 1.

Table 1: LMA Domains

DOMAIN	**Number of items**
Sensory Channel	12
Functional Vision	11
Literacy Media	20

4.3 Results for Validity of the new developed LMA

The results from the qualitative analysis were used to examine the validity of the developed instrument. For example, the findings related to identified items and domains were analyzed using quantitative methods. The validity was examined in three distinct approaches: Content validity, Construct validity and Face validity.

4.3.1 Content Validity of LMA

The Content Validity was first examined by using CVR in order to detect the appropriateness of the contents underline LMA instruments. Each item was calculated using the Lawshe's CVR formular. The results indicated that all the items scored CVR = 0, except item 29 and 35 which scored CVR =1. This means that the Items were appropriate for the LMA instrument. While the two items, were maintained after some amendments.

The content Validity was also examined by using I-CVI and S-CVI to determine the relevance of the item to the contents of the LMA instruments. This was calculated on CVR Excel spread-sheet. Table 2 shows the critical values for CVR which were used to determine the threshold of the accepted value of items.

Table 2: Critical Values for CVR

Number of Panelists/Experts	Critical CVR Values
5	0.99
6	0.99
7	0.99
8	0.75
9	0.78
10	0.62
11	0.59
12	0.56
13	0.54
14	0.51
15	0.49
20	0.42
25	0.37
30	0.33
35	0.31
40	0.29

Source: Lawshe, 1975

The results for the content validity are presented in the proceeding paragraphs.

4.3.1.1 CVR results for sensory channel Assessment

From a set of 12 items on the sensory channel Assessment domain, Content validity was calculated. Table 3 shows the results for CVR of items from the Sensory channel assessment domain of the new LMA.

Table 3: CVR Results for Sensory Channel Items

ITEMS	*N*	N_e	*I-CVR*	*S-CVR*
SC1	5	5	1	1
SC2	5	5	1	
SC3	5	5	1	
SC4	5	5	1	
SC5	5	5	1	
SC6	5	5	1	
SC7	5	5	1	
SC8	5	5	1	
SC9	5	5	1	
SC10	5	5	1	
SC11	5	5	1	
SC12	5	5	1	

Source: Researcher's data analysis (Output from Excel)

Table 3 shows that each item that was generated for the Sensory channels assessment domain has a content validity index of 1.00. Furthermore, the S-CVI is also 1.00. Lawshe's criteria for CVR, states that, if the panel consists of 5, the minimum value of CVR is 0.99. (*Refer to Table 2*). This indicates that all the items in the sensory Channel Assessment domain have reached the acceptance scale level of significance. Therefore, all the items developed for this domain qualified for further analysis.

4.3.1.2 CVR Results for Functional Vision Assessment

From a set of 11 items on the Functional Vision Assessment domain, Content validity was calculated. Table 4 shows the results on CVR.

Table 4: CVR Results for Functional Visual Assessment Items

ITEMS	*N*	*Ne*	*I-CVR*	*S-CVR*
FV13	5	5	1	1
FV14	5	5	1	
FV15	5	5	1	
FV16	5	5	1	
FV17	5	5	1	
FV18	5	5	1	
FV19	5	5	1	
FV20	5	5	1	
FV21	5	5	1	
FV 22	5	5	1	
FV23	5	5	1	

Source: Researcher's data analysis (Output from Excel).

The results show that the I-CVI score is 1.00 for each item and the overall S-CVI of 1.00. This also indicates that the CVI of these items has reached a significant level of acceptance for CVR. Since it is <0.99 for the 5-panelist level. Therefore, the items were adopted into the New LMA instrument.

4.3.1.3 CVR Results for Literacy Media Domain

This domain had 19 items. Content validity was also calculated for each item and the results are shown in Table 5.

Table 5: CVR Results for Literacy Media Assessment Items

ITEMS	N	Ne	I-CVR	S-CVR
LM24	5	5	1	1
LM25	5	5	1	
LM26	5	5	1	
LM27	5	5	1	
LM28	5	5	1	
LM29	5	4	0.8	
LM30	5	5	1	
LM31	5	5	1	
LM32	5	5	1	
LM33	5	5	1	
LM34	5	4	0.8	
LM35	5	5	1	
LM36	5	5	1	
LM37	5	5	1	
LM38	5	5	1	
LM39	5	5	1	
LM40	5	5	1	
LM41	5	5	1	
LM42	5	5	1	
LM43	5	1	0.2	

Source: Researcher's data analysis (Output from Excel).

The results in Table 5 shows that all the items except items ML29, ML34, and ML43 have a score of 1.00 CVR. This means that those items exceed the critical value of 0.99. Therefore, they were accepted. While the results for Item ML 29 and ML 34 have a score of 0.8 each. This indicates that they were below the threshold of the accepted critical value. However, the items were accepted because over 50% of Panelists agreed, and when the S-

CVI was calculated it scored 1.00. The results for Item 43 show a score of 0.2. and it is insignificant if compared to the Lawshe's critical value of 0.99, as such, the item was removed from the instrument. This means that 19 items were maintained in the Literacy media assessment domain for further analysis.

4.3.2 Results for Construct Validity of the developed LMA instrument

The construct validity was examined through statistical analyses using factor analysis. The factor analysis played a crucial role to validate the instrument. It helped to explore the latent factors or structures that underline the constructs of LMA instrument. It also helped refining instrument by returning only the most relevant items. This reduces redundancy and improves on the efficiency and clarity of the instrument. Detailed analysis is presented below.

4.3.2.1 Factor analysis

Factor analysis was performed on the remaining items using component Factor analysis (PCA). The analysis used the Principal Axis Factoring (PAF) technique with varimax rotation, providing the KMO statistics and determinant of the correlation matrix. Furthermore, all the factors were retained with the Kieser Criterion (Eigenvalues of >1). All factor coefficients were suppressed with less than 0.50 coefficient to establish the construct validity of the new LMA instrument. This was run separately for each domain of the instrument. These are sensory channel assessment, functional vision assessment, and Literacy media assessment.

4.3.2.2 Construct Validity Results for Sensory Channel Assessment Domain

Firstly, the Kaiser-Meyer-Olkin (KMO) test and Bartlett's test were performed on Sensory Channel domain items to determine the suitability of the data set for factor analysis. Kaiser suggested that significant level for KMO test is $p > 0.5$. While the significant level the Bartlette's test is $p<.001$, (William et al, 2012). Table 6 shows the results.

Table 6: KMO and Bartlett's Test for Sensory Channel Domain

Kaiser-Meyer-Olkin Measure of Sampling Adequacy.		.611
Bartlett's Test of Sphericity	Approx. Chi-Square	143.940
	Df	66
	Sig.	.000

Source: Researcher's data analysis (SPSS)

Table 6 indicate that KMO produced a value of .611. This exceeds the significant level of > 0.5 for sampling adequacy. The results for Bartlett's test of sphericity shows a 143.940 (p = 0.000) which also exceed the significant level of < 0.01. This indicates that all the 12 items in the Sensory Channel Assessment domain are suitable for factor analysis. Further investigation on factor analysis was conducted to determine the number of factors to be extracted from the 12 items. Varimax method of rotation was performed. Table7 shows the result of data rotated with varimax.

Table 7: Rotated Component Matrix for Sensory channel Assessment domain

	Component		
	1	2	3
SC8	.792		
SC9	.779		
SC7	.777		
SC12	.636		
SC10	.560		
SC5		.930	
SC4		.857	
SC11		.652	
SC2			.758
SC6			.693
SC1			.591
SC3			.518

Source: Researcher's data analysis

Table 7 shows that 3 factors explain the construct of the sensory channel assessment domain. The cases where 3 or more items showed a higher factor loading of 0.5 on a specific factor were selected. The loadings with less than 0.5 were suppressed in the SPSS output since they do not provide a strong base to be in a component. The results in Table 4.6 show that Items SC8, SC9, SC7, SC12, and SC10 load very well in Component 1. Items SC5, SC4, and SC11 also load pretty well in Component 2, and Items SC2, SC6, SC1, and SC3 load very well in Component 3. All the 12 items had high loading factors on the component they belong to. High loadings typically indicate a strong relationship between the variable and the underlying factor, (Fabrigar et.al., 1999). This means that all the items on this domain were maintained for further analysis.

Furthermore, the scree plot graph was also used to determine the number of factors extracted. The Kaiser Criterion of Eigenvalue of >1 was used. The graph in Figure 4 shows the results of several factors present.

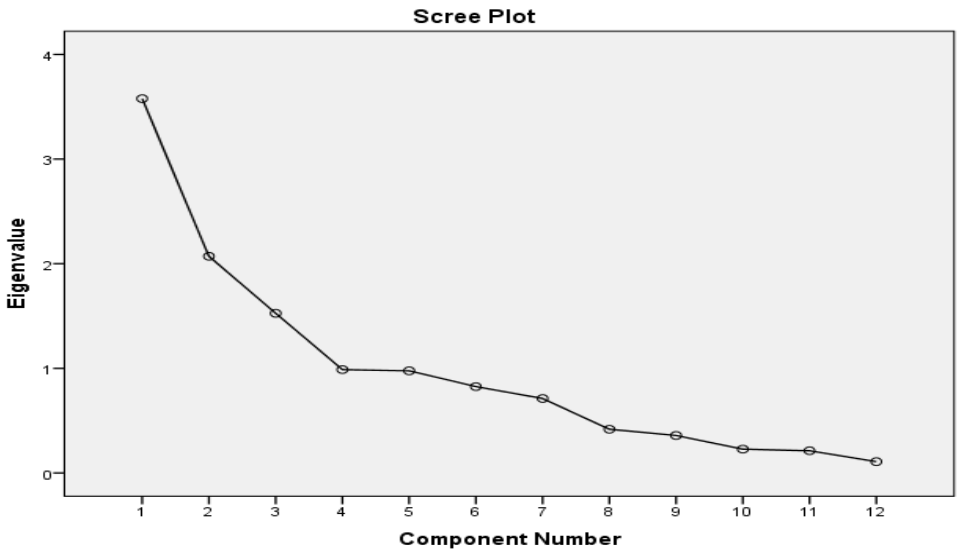

Figure 4: Scree Plot graph for Sensory Channel Assessment

According to Kaiser (1960), a recommend criterion to determining the number of factors to retain components with Eigenvalue greater than 1. The scree plot clearly shows the horizontal axis of graph has three factors or component number that are greater than 1 on the vertical axis (Eigenvalue). Therefore, the decision was made that all the items in this domain were taken on board for further analysis.

The results of the Eigenvalues and percentage of variance are explained by three factors that are displayed in Table 8.

Table 8: Total variance explained on Sensory channel Assessment domain

Compone-nt	Initial Eigenvalues			Extraction Sums of Squared Loadings			Rotation Sums of Squared Loadings		
	Total	% of Variance	Cumulative %	Total	% of Variance	Cumulative %	Total	% of Variance	Cumulative %
1	3.578	29.814	29.814	3.578	29.814	29.814	2.825	23.541	23.541
2	2.071	17.258	47.071	2.071	17.258	47.071	2.420	20.166	43.707
3	1.526	12.717	59.789	1.526	12.717	59.789	1.930	16.082	59.789
4	.988	8.235	68.024						
5	.976	8.134	76.158						
6	.825	6.879	83.037						
7	.712	5.931	88.968						
8	.418	3.484	92.452						
9	.358	2.984	95.435						
10	.228	1.897	97.332						
11	.212	1.769	99.101						
12	.108	.899	100.000						

Source: Researcher's data analysis (SPSS)

Table 8 shows that there are three factors with the Eigenvalues greater than one. The three factors explain 59.789% of the total variance in the sensory Channel Assessment domain. The value greater than 50% is accepted level of significance, (Tabachnick and Fidell, 2013). Therefore, all the items in the Sensory channel domain were selected for further analysis.

4.3.2.2 Construct Validity Results for Functional Vision Assessment Domain

The KMO test and Bartlet's test were also performed on Functional Vision Assessment Domain items to determine the suitability of the data for factor analysis. Kaiser (1974) categorize that KMOl values between ≤ 0.70 and 0.80 is middling. This range suggest that the variables are moderate level of common variance.

Table 9: KMO and Bartlett's test for Functional Vision Assessment

KMO and Bartlett's Test

Kaiser-Meyer-Olkin Measure of Sampling Adequacy.		.780
Bartlett's Test of Sphericity	Approx. Chi-Square	236.101
	Df	55
	Sig.	.000

Source: Researcher's data analysis (SPSS)

Table 9 shows that the KMO test result is 0.780 that falls under middling category of Kaiser. The Bartlet test results show a significant value of 0.000. These results indicate that the data was considered appropriate for factor analysis.

a) Communalities for Functional Vision Assessment Domain

The investigation was made on commonalities of items for Functional Vision Assessment. The size of communality was used as a criterion for variables in factor analysis, (Williams et al, 2015). Communality is defined as the total sum of the squared factor loadings for the variable/item. Item communality is a numerical measure of how much an item's variance is being captured by the factor model, (Brown, 2015). Table 10 shows the results of the communality for 11 Items on the Functional vision assessment of the new LMA.

Table 10: Communalities for Functional Vision Items

Item	Initial	Extraction
FV13	1.000	.731
FV14	1.000	.782
FV15	1.000	.562
FV16	1.000	.701
FV17	1.000	.900
FV18	1.000	.763
FV19	1.000	.790
FV20	1.000	.831
FV21	1.000	.836
FV22	1.000	.906
FV23	1.000	.639

Table 10 indicates that the communality values range from 0.562 to 0.906 in the functional Vision Assessment. It is recommended that items with value above 0.70 are well represented by the factor solution, (Hairs et.al, 2010). This indicating that most of the items except FV15 and FV23, had a significant percentage of their variance explained by the factor. Conversely, the communality for item FV15 and item F23 were less than 0.70. This indicates that these two items might not be well represented by the current domain. However, Tabachnick and Fidell, (2013), argue that the communality coefficient scaled at 1.0 or to the nearest 1 in value complete underlining element for the observed variability. In addition, Hairs et.al (2010) categorized the communalities values 0.40 to 0.70 as moderate values. According to them, values within that range contribute meaningfully to the factor but still return some unique variance. This shows that all the items were qualified to be part of the developed instrument.

b) Number of Extracted Factors

Factor extraction involves identification of number of factors that explain factors that underline the construct, (Hairs et.al, 2005). Varimax method of rotation and scree plot graph were used in the investigation of a specific number of factors to be extracted.

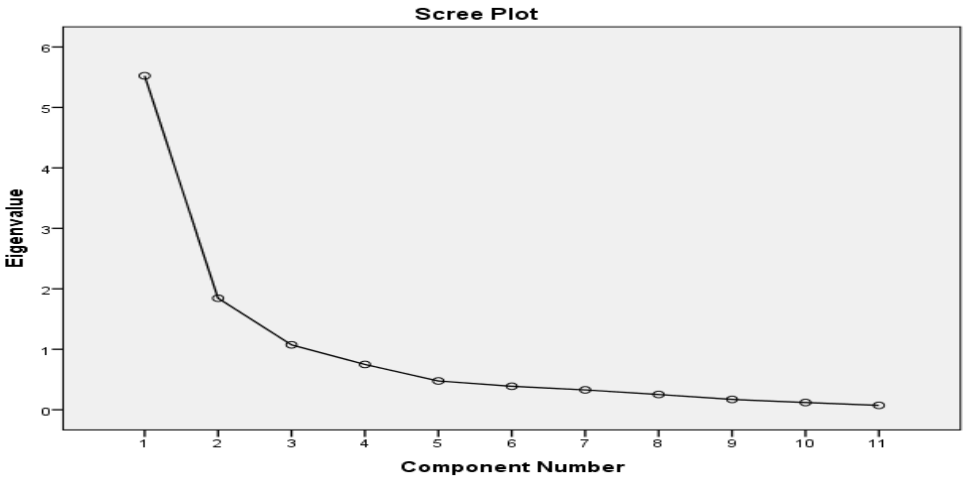

Figure 5: Scree Plot Graph for Functional Vision Assessment

The scree plot graph shows that three factors fall under the Eigenvalue >1. Analytically, a strong and valid decision was made on several factors. Furthermore, Table 11 shows the number of factors and total variance explained on the underline construct of the functional vision assessment domain of the developed LMA.

Table 11: Total Variance Explained on Functional Vision Domain

Component	Initial Eigenvalues			Extraction Sums of Squared Loadings			Rotation Sums of Squared Loadings		
	Total	% of Variance	Cumulative %	Total	% of Variance	Cumulative %	Total	% of Variance	Cumulative %
1	5.523	50.210	50.210	5.523	50.210	50.210	4.135	37.590	37.590
2	1.845	16.769	66.978	1.845	16.769	66.978	2.209	20.085	57.675
3	1.074	9.761	76.739	1.074	9.761	76.739	2.097	19.064	76.739
4	.749	6.813	83.552						
5	.476	4.329	87.881						
6	.389	3.533	91.414						
7	.328	2.986	94.401						
8	.253	2.297	96.697						
9	.171	1.558	98.255						
10	.119	1.086	99.341						
11	.072	.659	100.000						

Source: Researcher's data analysis (SPSS)

The results from Table 4.13 show that three factors load very well with the model. It also shows that the cumulative variance is 76.739%. This means that the three factors explain 76.739% of the variation in the data.

c) The rotated component matrix for the Functional vision assessment domain

For a clear understanding of the factor loading, the rotated component matrix was examined. Table 12 shows the loadings of 11 variables on three factors of extraction.

Table 12: Rotated component Matrix for functional vision domain

	Component		
	1	2	3
FV22	.919		
FV21	.889		
FV20	.885		
FV23	.715		
FV16	.585	.508	
FV15	.559		
FV13		.850	
FV14		.834	
FV17			.944
FV18			.738
FV19	.565		.587

Source: Researcher's data analysis

The higher the value themore they contribute to the variables. In this case, the items on the FVA domain contribute to the construct of LMA. The factor loadings are distributed very wellall the factors have at least Three or more elements that contribute to a single factor.

4.3.2.3 Construct Validity Results for Literacy Media Assessment Domain

The KMO and Bartlett's tests were also conducted on items for the Literacy Media Assessment Domain.

Table 13: KMO and Bartlett's Test results for Literacy Media Assessment

Kaiser-Meyer-Olkin Measure of Sampling Adequacy.		.546
Bartlett's Test of Sphericity	Approx. Chi-Square	552.049
	Df	153
	Sig.	.000

Source: Researchers data analysis (SPSS)

The results are in Table 13 shows that the KMO is .546 and Bartlett's test is 0.000 (p = 552.049) for the domain. This indicates that the items exceed the cut-off point of KMO and the significant level of 0.001 of Bartlett's test of Sphericity. Kaiser (1974) categorize KMO measures with value from 0.50 to 0.59 as miserable. This means indicates that the data has poor sampling adequacy. However, the items still have the potential for factor analysis because it exceeds the cutoff point of $p > 0.50$. In addition to that, the Bartlett's Test is less than 0.01 recommended significant level.

The communalities of items for the Literacy Media Assessment instrument were examined to find out how well the model fits the individual variables. Table shows the results of communalities for the second attempt with 18 items from the Literacy Media Assessment domain.

Communalities represent the proportion of variance in each observed variable that is counted for by the extracted factors, (Tabachnick and Fidell, 2012). Table 14 shows the communalities for Literacy Media Assessment items.

Table 14: Communalities for Literacy Media Assessment Item

	Initial	Extraction
LM24	1.000	.711
LM25	1.000	.857
LM26	1.000	.781
LM27	1.000	.789
LM28	1.000	.799
LM29	1.000	.606
LM30	1.000	.852
LM31	1.000	.878
LM32	1.000	.884
LM33	1.000	.906
LM34	1.000	.825
LM35	1.000	.851
LM36	1.000	.931
LM37	1.000	.793
LM38	1.000	.757
LM39	1.000	.742
LM41	1.000	.597
LM42	1.000	.706

Source: Researchers data analysis (SPSS)

The results show that item LM40 was suppressed from the set of items from the Literacy media assessment. That means the item has low communalities below 0.50. Stevens, (2012) outlined that low communalities close to 0 do not explain much of the variance in the observed variables. This indicates that Item LM40 was removed from the data set of the selected items. The results for the remaining items show that they are all above 0.50. The communalities close to 1 suggest that the extracted factor explains a large portion of the variance in the observed variable, (Hairs, et al., 2018). This means that the remaining items indicate a good fit between the factors and the variables. Therefore, the items were retained in the data set of items for the new instrument.

Several factors were examined using the scree plot graph. Figure 6. Shows the results of the number of factors that were extracted from the Literacy media assessment domain.

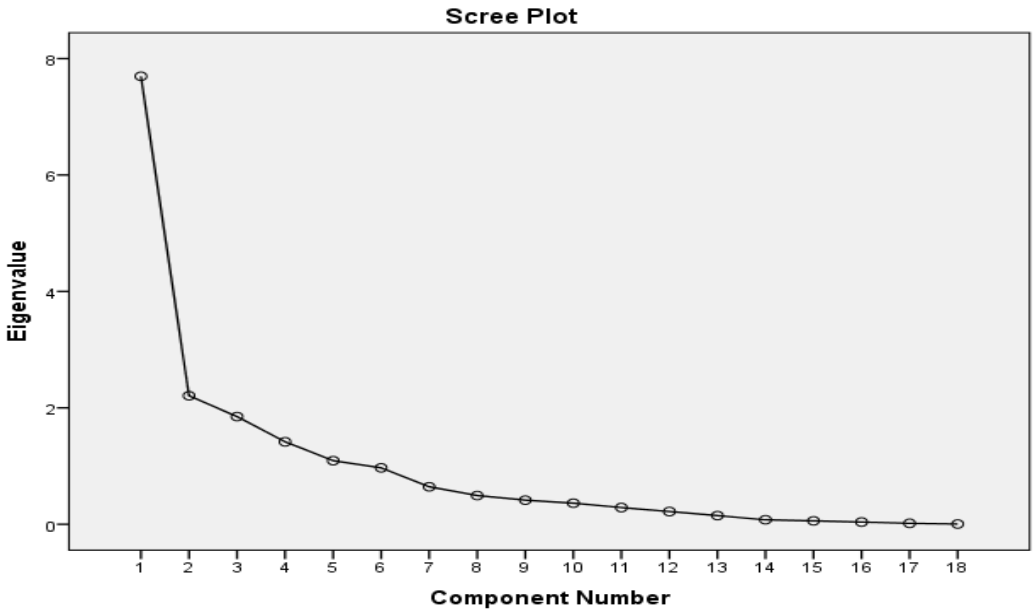

Figure 6: Scree Plot graph Literacy Media Assessment

Factors with Eigenvalues greater than 1 are suggested to be a component, (Cattell, 1966). The graph shows a smooth decrease of Eigenvalues appears to drop at the fifth principal component. Five components have with Eigenvalue greater than 1. This means that, significantly, the five components clarify well the construct of the Literacy media assessment domain.

Table 15 confirms the extraction of five factors that explain the variance of the Literacy Media domain. In addition, the table also shows that the cumulative Percentage of loadings is 79.246 %. This indicates that the items.

Table 15: Total variance explained in Literacy media Assessment domain

Total Variance Explained

Component	Initial Eigenvalues			Extraction Sums of Squared Loadings			Rotation Sums of Squared Loadings		
	Total	% of Variance	Cumulative %	Total	% of Variance	Cumulative %	Total	% of Variance	Cumulative %
1	7.696	42.755	42.755	7.696	42.755	42.755	3.499	19.436	19.436
2	2.209	12.271	55.026	2.209	12.271	55.026	3.125	17.362	36.798
3	1.850	10.278	65.304	1.850	10.278	65.304	2.998	16.658	53.456
4	1.417	7.870	73.173	1.417	7.870	73.173	2.996	16.644	70.100
5	1.093	6.072	79.246	1.093	6.072	79.246	1.646	9.146	79.246
6	.970	5.388	84.634						
7	.644	3.577	88.211						
8	.493	2.740	90.951						
9	.415	2.304	93.255						
10	.362	2.013	95.268						
11	.287	1.593	96.861						
12	.219	1.217	98.078						
13	.150	.831	98.909						
14	.077	.428	99.337						
15	.059	.328	99.665						
16	.039	.215	99.880						
17	.017	.093	99.974						
18	.005	.026	100.000						

Source: Researcher's data analysis (SPSS)

The variables for the Literacy media assessment domain were examined using the rotated component matrix. Loadings below 0.50 were suppressed. Table shows the results of high loadings for each component.

Table 16: Rotated the component matrix for the Literacy Media Assessment

Rotated Component Matrix

	Component				
	1	2	3	4	5
LM38	.849				
LM39	.806				
LM37	.596				
LM24	.578				
LM35	.538		.503		
LM31		.870			
LM30		.765			
LM36		.557			
LM34			.712		
LM33	.537		.684		
LM32		.587	.658		
LM27			.653	.555	
LM28			.651		
LM42				.839	
LM26				.760	
LM25		.518		.737	
LM29					.742
LM41					-.532

Table 16 indicates that variables are loaded in five components. According to Tabachnick and Fidell (2013), high loadings indicate a strong relationship between the variable and the underlying factor. This means that the items have a strong relationship with underlying factors and the LMA instrument in general. The pattern of the loadings of cross components was also examined that there are three or more variables loaded on factor 1, factor 2, factor

3, and factor 4. While factor 5 has only two variables with high loadings. The variables with high loadings on a particular component are likely associated with that factor, (Stevens, 2009). However, a decision is made that the literacy media assessment will have 4 factors simply because factor 5 has 2 variables. As such, those variables were assigned to related components.

To summarise, the factor analysis of the developed LMA instrument identified three components for sensory channel assessment and functional vision assessment domain. respectively. While the Literacy Media Assessment originally produced five components, however, it was reduced four domains. These factors were identified by examining the factors in different forms. For example, the rotated component matrix, and the scree plot graphs were analyzed using the eigenvalues that gave evidence of the factor. Hairs et.al (2010) recommend that factors that are above 1 qualify to be a factor. In addition, the percentage of the accumulative as well as the communalities comprehend the results for the factor analysis.

4.3.3 Face Validity

The instrument was subjected to individual opinion by Five people, which comprised of two specialist teachers and three Experts to check on the general outlook of the new instrument, grammar, spelling, typing errors, and use of words, *(refer to appendix 9*). However, some features of the general outlook were based on the inputs made by some teachers during data collection on Content and construct validity. The following were noted during those sessions; there was too much technical language/wording in some of the items, which could be difficult for Mainstream Teachers to understand. So, those items were modified. For instance, items like, *Does the learner have a visual acuity of less than 6/18?* was amended to "*Does the learner identify objects at a distance?*", While "*Does the learner have a visual field less than 20 degrees?* was amended to *Does the learner have a blind spot or restricted visual field?* Eventually, the majority of the individuals applauded the appearance of the developed LMA instrument.

4.4 Results for Reliability of the developed LMA

Reliability was conducted using a statistical measure of Cronbach's alpha in SPSS to determine the internal consistency reliability of each domain of the developed LMA instrument. The Cronbach's alpha helped to assess the reliability of the instrument by comparing the amount of shared variance among items. A high Cronbach's alpha value indicates that the items within the assessment are well correlated and collectively provide a reliable measure of the instrument. The general guidelines and their interpretations of reliability coefficient value are presented in Table 17.

Table 17: Guideline for reliability coefficient

Cronbach's alpha	Internal consistency
$\alpha \geq 0.9$	Excellent
$0.9 > \alpha \geq 0.8$	Good
$0.8 > \alpha \geq 0.7$	Acceptable
$0.7 > \alpha \geq 0.6$	Questionable
$0.6 > \alpha \geq 0.5$	Poor
$0.5 > \alpha$	Unacceptable

Source: www.statisticshowto.com

4.4.1 Reliability Results for Sensory Channel Domain

The reliability of 12 items in the Sensory channel domain was calculated to determine the consistency of whether the items measure the same construct. The results of the Cronbach's alpha value are 0.740 and 0.755 for standardize items as shown in Table 18.

Table 18: Reliability of the total items for the Sensory Channel Domain

Cronbach's Alpha	Cronbach's Alpha Based on Standardized Items	N of Items
.740	.755	12

Using the guidelines for the Reliabilities coefficient above in Table 18 the Cronbach α coefficient ≥ 0.70 is interpreted as good. Thus, Sensory Channel items reached acceptable internal consistency. This shows that all the 12 items are consistence in measuring the Sensory channel. Therefore, it is connected to the interrelatedness of the items within the LMA instrument.

4.4.2 Reliability results for Functional Vision Assessment domain

The internal reliability was also conducted using the statistical Cronbach's Alpha for the items in the functional vision assessment domain. The output of the results are presented in Table 19.

Table 19: Reliability Statistics of Total Items in Functional Vision Assessment

Reliability Statistics

Cronbach's Alpha	Cronbach's Alpha Based on Standardized Items	N of Items
.887	.890	11

Table 19 shows the Alpha (α) value of 0.887 for 11 items in the domain. If compared to the guidelines for the reliability coefficient in Table 4.18, the results indicate that the alpha value for the reliability coefficient is very good and acceptable. This means that the items are highly correlated with the measures. Therefore, all the items were adopted into the new instrument.

4.4.3 Reliability Results of Literacy Media Assessment Domain

The reliability of the 18 items in the Literacy media domain with Cronbach's Alpha is 0.907, as shown in Table 20.

Table 20: Reliability Statistics for Literacy Media Domain

Cronbach's Alpha	Cronbach's Alpha Based on Standardized Items	N of Items
.907	.909	18

Again, if compared with the guidelines in Table 20, the Cronbach's alpha coefficient is excellent. This means that the items in the literacy Media are highly correlated. Therefore, it was inferred that the items measure the same latent variable. Hence, all 18 items in this domain were adopted for the new instrument.

4.5 Labeling Items for the Final Learning Media Assessment Instrument.

From the successful results of qualitative analyses as explained in section 4.1 of chapter 4, item pool, and domains were generated. The results from Content validity and construct validity helped to remove items that did not meet the psychometric properties. 41 items are Psychometrically valid and reliable and were selected to be part of the new LMA instrument. Reliability and validity are important aspects of any robust instrument, (Messick, 1994; Hairs, et al., 2009).

Further investigation was conducted on the results of factor analysis and the remaining items to label the extracted factors. Snow (2006) and Gorsuch (1983) suggest that the components or factors should be grouped and labeled based on the framework or constructs that are being investigated. The grouping of items after factor analysis allows labeling of different realizable sub-domains, (Snow,2006). Therefore, variables with high loading were assigned and labeled based on the theoretical framework and constructs of an LMA instrument. The labeling helps to easily interpret the components or factors that were

extracted to give more meaning. Table 21 shows how factors in each domain were labeled and its variables/ items.

Table 21: Item numbers developed for the sub-domain

Domain	Factor Number	Sub-domain	Items
Sensory channel	1	Auditory assessment	8, 9, 5, 6.7
	2	Tactile assessment	1, 2, 3, 4
	3	Vision assessment	10,11, 12
Functional Vision	1	Visual Acuity	13, 14, 15,
	2	Visual field	19, 20, 17, 18
	3	Fixation	16, 21, 22,23
Literacy Media	1	Literacy materials	24,25,27, 28, 29,30, 31,
	2	Reading distance and Font size	34,36, 37
	3	Background Color	39, 40,41
	4	Reading speed	38, 32,35

Source: Researcher's data analysis

Table 21 indicates that the sensory channel assessment domain has three factors, labeled, auditory assessment tactile assessment, and vision assessment. Auditory assessment and tactile assessment were given four items each, and tactile assessment was given 3 items. Functional vision assessment domain has 3 factor loadings, factor 1 is labeled visual acuity, factor 2 is labeled visual field and factor 3 is labeled fixation. The literacy media assessment domain which has four factors, has been labeled as follows: factor 1 is labeled literacy materials, factor 2 is reading distance and font size, factor 3 is background colour and the last factor is reading speed.

4.6 The layout of the developed LMA instrument

The Layout of the instrument included the preamble which contains particulars of the Learner; Part A for Sensory channels Assessment; Part B for Functional Vision Assessment; and Part C for Literacy media Assessment items. The remarks and name of the assessor are also part of the instrument.

4.7 Chapter Summary

The chapter provided results from qualitative analysis where items for the LMA instrument were created. The results of content validity, construct validity, and reliability were also presented, as their interpretation for each domain in the LMA instrument. Furthermore, the chapter provided the analysis of component extraction on factor which led to the creation of sub-domains of the instrument. Lastly, the chapter provided results on the face validity of the general outlook of the new instrument. The next chapter is a summary and implications of the study; and some recommendations for further studies.

CHAPTER 5

SUMMARY, CONCLUSIONS AND IMPLICATIONS

5.1 Chapter overview

This chapter discusses the key research findings. It has also a conclusion section based on the study outcomes of the research questions. Finally, it gives recommendations for further studies related to the topic.

5.2. Summary and discussion of Results of Key Research findings

This study aimed to develop a Learning Media Assessment instrument for learners with disabilities in Malawi. Exploratory sequential design of mixed research was used to generate the results of this study. This used the qualitative data analysis to generate results for item development of the instrument to achieve objective one. Then results from this were integrate to quantitative data analysis which helped to achieve objectives two and three on examination of validity and reliability, respectively.

5.2.1 Summary of item pool development results.

Initially, a pool of 43 items for the LMA instrument was developed. The items were developed taking into account three domains which were identified through framework analysis and qualitative content analysis of LMA instruments. These domains include sensory channel (12 items), Functional Vision assessment (11 items), and Literacy media assessment (20 items). However, the study also revealed that environment is another domain that constitutes the LMA instrument, (Bruce et al, 2012). Environment is not included as a stand-alone domain. However, the items in the environment were captured and embedded within the spotted domains. As such, the results were not affected.

5.2.2 Summary of results for Validity of the developed LMA instrument

The validity was examined in three approaches, which include content validity, construct validity, and face Validity.

Firstly, results for content validity show that all 12 items in the sensory channel and 11 items in the function vision assessment scored 1.00 CVI. If this value is compared to Lawshe's CVR critical value of 5 panelist size (*N*) which is 0.999, the CVR is higher than the critical value. Items in the Literacy media assessment indicated that all the items were also within the acceptable range of greater than the required critical value except one item which scored a CVR of 0.02. This item was removed from the instrument because it was below the required CVR critical value. This indicates that the remaining items were fitting to the latent variable of LMA and its domains in terms of appropriateness, representativeness, and relevance. This means that the content validity of the 42 items was satisfactory.

Secondly, the Construct validity of the instrument was established through factor analysis. Factor analysis method is an incredibly useful tool for the development of high-quality measures of constructs that are not directly observed, (Tavakol and Wetzel, 2020). Specifically, Component factor analysis with rotated varimax in each domain was conducted. The results for the loadings on the component matrix of the sensory channel assessment domain show that all the items were found to be moderate to high (0.518 - 0.930). this supports the construct robustness of the LMA instrument. The cumulative percentage of variance is 58. 5%. This indicated that all the items were higher than the cutoff point of >0.50. Furthermore, the factor loadings show that there were three factors extracted this explains that the sensory channel can be explained by three factors. Thus, the items were investigated along those three factors. Therefore, the domain was divided into three sub-domains which include tactile, auditory, and visual assessment. The sub-domains that were singled out are the most used senses in classroom situations. Hence, teachers need to keep in mind these three senses when choosing teaching methods, teaching strategies, and preparing teaching and learning materials in an inclusive setting class, to increase participation among learners with disabilities.

Furthermore, the outcomes for factor loadings on functional vision also show that all items in this domain were in the range of 0.559 – 0.919 with an accumulative variance of 79.246 %. According to Tavakol and Wetzel (2020), Factor loadings of more than 0.30 usually indicate a moderate correlation between the item and the factor. So, the factor loadings for Factors 1, 2, and 3 are related to the construct of LMA. Similarly, the factor loadings for Literacy media in factors 1,2,3 and 4 exceed 0.30, and also have a cumulative percentage of 79. 246. thus, they are correlated to the construct of LMA.

The results on communalities were generally above 0.50 for all the variables in all the domains except item 39 in the literacy media domain which had a score of 0.20. According to Hairs, (2009), explains that, between 0.25 and 0.50 is an acceptable cutoff value. This indicates that all the items except item 39 are well represented by the factors they belong to. Therefore, that item was removed from the list of items for the developed LMA instrument.

Thirdly, face validity was conducted. Two items were slightly modified to increase the clarity. Clarity in items contributes to reliability and validity, (Nunally and Bernstein, 1994; DeVellis, 2017). This is so because the meaning and concept of those items did not change. This means the inferences of the modified items will bring the same results as the original items. This will not only help to increase the usability of the instrument among Main Stream Teachers and Specialist Teachers but also help them to comprehend the LMA procedures. In addition, clear and comprehensible items reduce the likelihood of misinterpretation, (DeVellis, 2017).

5.2.3 Summary of Reliability results of the developed LMA Instrument

The Internal consistency reliability is commonly measured in CTT using Cronbach's alpha, (Streiner 2003). The results show that Cronbach's alpha values of 0.740 and 0.755 based on standardized items yielded 0.755 for the Sensory channel domain and also the Alpha (α) value of 0.867 for the functional vision domain. In addition, Cronbach's Alpha value for the literacy media domain is 0.907. In this case, the average Cronbach's alpha of LMA is above 0.80 indicating good internal consistency. This means that there is an internal

correlation between the items and the instrument itself. Even though, Streiner (2003) pointed out that values over 0.9 suggest that there is item redundancy. However, the fact that Cronbach's alpha coefficients are known to increase as the number of items in a scale increases. Therefore, this is an unbiased measure of consistency.

5.3. Conclusion

The study successfully developed the LMA instrument, (*refer to appendix 10*). There was considerable variability in the amount and quality of psychometric evidence for the developed instrument. The study created a new measure for LMA with the sensory channel, functional vision, and Literacy Media domains. The sub-domains were also created to give more meaning to the construct of LMA. With this, Mainstream Teachers and Specialist Teachers will be able to use the instrument to assess the learning media of Learners with disabilities. Thus, it will help them make informed decisions on teaching and learning materials, teaching methods, literacy materials, and seating plans to suit learners with disabilities. This will also help stakeholders to assign proper examination papers by using evidence-based data. This will also help the Implement Inclusive Education, as LMA ensures that learners with disabilities will have equal access to Education as their peers.

5.4 Implication of the Study

The implication of the study is that it can guide the development and refinement of items for the new LMA instrument. The study can also help to contribute to the broader acceptance and utility within the Psychometric field of study.

The study also provides a theoretical framework that can be incorporated into reading as well as numeracy programs in Malawi. This is so because for a child to access reading and writing, he or she needs accessible materials such as the new instrument that can generate the data.

However, this study has a limitation in terms of the generalizability of the results. This is so because the study did not cover a wide study area. In addition, those who advocate for IRT may rate the sample size as inadequate and could rate it as poor. Another limitation

is that the blueprint of the LMA instrument is not available in the literature. It was difficult to regulate the number of items that could be constructed per domain or sub-domain. This can bring criticism from other quarters.

5.5 Further Research

The following are Suggestions for future research on the development of LMA instruments:

- The results of this study are for internal Validity and reliability. There is a need to investigate the external validity and reliability of the instrument. It can consider referenced-criterion validity and test re-test reliability. That is, there should be a pilot testing of the instrument on the ground. Then over a while, it should be tested again to find out whether the instrument is still valid and reliable.
- Another future research should be on the development of the same LMA instrument using Item response theory (IRT) since this study was done using the Classical Test Theory (CTT) which allows a small sample size. In other quarters, CTT results may not generalized because the sample study may be considered to be too small, while, IRT uses a large sample size, (DeMars, 2010).
- Furthermore, future research can be developed using Multidimensional scaling (MDS). The MDS poses no restrictions as compared to factor analysis to extract the underlying factors in multivariate normal and the relationships among variables are linear, (Borge and Groenen, 2005). It is argued that MDS yields more readily, solutions, (Cox and Cox, 2001: Kruskal and Wish, 1979). It helps to reveal hidden patterns or structures in data. By representing objects in a low- dimensional space, it is easy to identify clusters of similar items outliers, or other interesting patterns, (Hassan, 2023).

5.6 Recommendations

The following are the recommendations;

- LMA instrument developers should ensure that the items are easily understood by the users. This will help to increase the validity of the inferences of data derived

from the instrument. Thus, it will help to establish or develop a psychometrically sound instrument. In addition, the LMA Instrument developers may also consider additional instruction on the interpretation.

- When developing a new instrument which have no previous studies or it is new idea, developers should use Exploratory sequential design because this will help to gather in-depth understanding of the new concept before proceeding to psychometrical proof of that particular instrument.

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APPENDICES

Appendix 1: INFORMED CONSENT FORM

Research purpose and procedures: The main purpose of the research is to develop a learning media assessment instrument for learners with disabilities: A case of Shire Highlands Education Division in Malawi. You are required to answer questions/rate the items in terms of representativeness, appropriateness, and relevance to Learning media assessment instrument". The research will not take more than an hour to be completed. I, therefore, request that you provide me with your information.

Risks and discomforts of the research study: The foreseeable risk of the research is that some of you may not know the terminology of learning media assessment. However, this will be controlled by defining learning media assessment in layman's language. If necessary.

Potential benefit of the research study: The information that will be gathered will help to come up with a robust instrument that will help teachers, learners with disabilities, and stakeholders in the implementation of inclusive education in Malawi

Alternative procedures: The alternative procedure is the use of online. Therefore, you can complete the interviews/rate items and answer the questions through WhatsApp or email.

Confidentiality provisions: the names of participants will not be disclosed to anyone. It will remain anonymous.

Research-related injury: There are no anticipated injuries that can occur during the research.

Voluntariness in participation and the right to discontinue participation without penalty: Participation is voluntary and you have the right to withdraw any time you wish to do so, at any time without penalty.

Contacts for additional information: If you have questions about the research,

You can contact me at the following address: University of Malawi, P.O. Box 280, Zomba. E-mail: med-mev-05-19@unima-ac.mw or jkanyongo@gamil.com Cell No: + 265 999 444 226.

You can also contact Dr. Victoria Ndolo, Chairperson of the University of Malawi Research

Ethics Committee **(UNIMAREC**), P.O. Box 280, Zomba. +2" 995 0427 60

Do you agree to continue with the study? YES NO

Name of the respondent:

Age:

Male/Female

Signature:

Date:

Name of the interviewer:

Signature:

Date:

THANK YOU

Appendix 2: Low Vision Tool Kit

VISION SCREENING – Referral form Malawi – Low Vision programme

To be filled by the Ophthalmic Medical Assistant

Specialist teacher/Person who screens, fills in this side, the O.M.A. the other side

Name:		School/RC/ITP:		
Age:	Sex:		Date:	
Visual acuity:		Teacher's findings		
		RE	LE	BOTH
DISTANCE	Unaided			
	Pinhole			
	With specs used now			
		BOTH EYES		
NEAR	Unaided	Dist. =	cm	
	With specs	Dist. =	cm	

Remarks (complaints, previous treatments/operations)

.....

.....

Name teacher

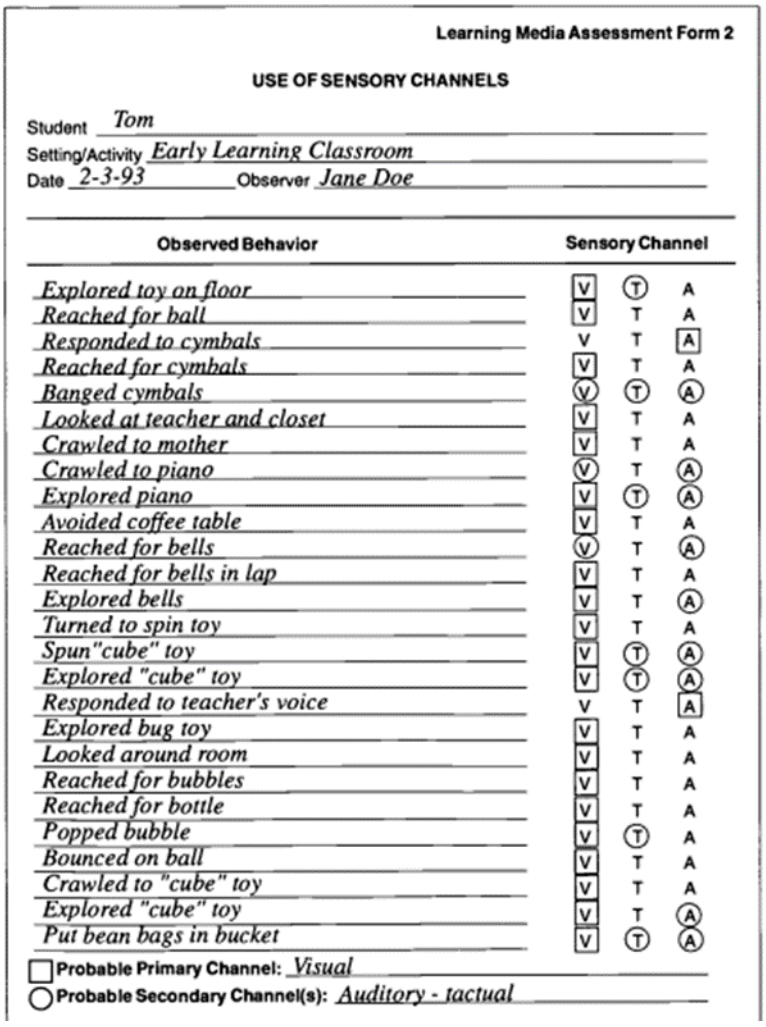
VISION SCREENING – Referral form Malawi – Low Vision programme

To be filled by the Ophthalmic Medical Assistant

For OMA: Please fill the information asked and give the form back to the patient

Name client:			**Date seen**	
Cause of blindness/Low Vision:			Other impairment:	
Visual acuity	DISTANCE			NEAR
	RE	LE	BOTH	BOTH EYES
Unaided				
Refraction	R		L	
Visual acuity	DISTANCE			NEAR
	RE	LE	BOTH	BOTH EYES
With specs				
Spectacles	Will not improve vision: ☐			
	In use now:	R		L
	Newly ordered: 1. Distance:	R		L
	To be used:	Constantly ☐		Distant only ☐
	2. Reading	R		L
Comments/Action/Referral:				

Appendix 3: Use of sensory channel Instrument



Learning Media Assessment Form 2

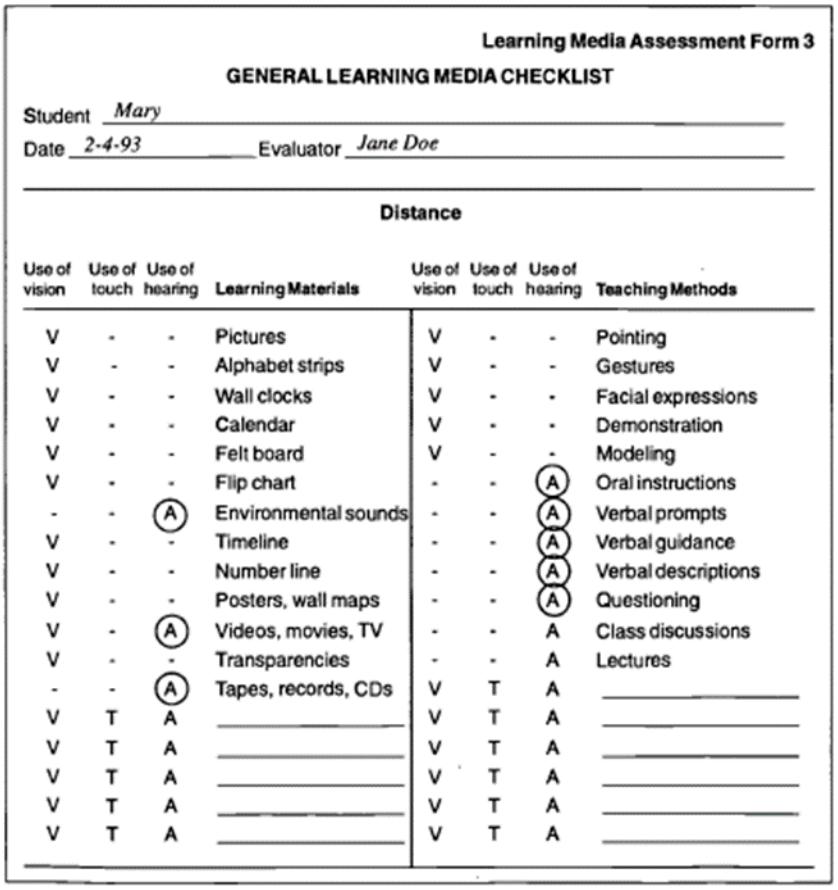
USE OF SENSORY CHANNELS

Student *Tom*
Setting/Activity *Early Learning Classroom*
Date *2-3-93* Observer *Jane Doe*

Observed Behavior	Sensory Channel		
Explored toy on floor	[V]	(T)	A
Reached for ball	[V]	T	A
Responded to cymbals	V	T	[A]
Reached for cymbals	[V]	T	A
Banged cymbals	(V)	(T)	(A)
Looked at teacher and closet	[V]	T	A
Crawled to mother	[V]	T	A
Crawled to piano	(V)	T	(A)
Explored piano	[V]	(T)	(A)
Avoided coffee table	[V]	T	A
Reached for bells	(V)	T	(A)
Reached for bells in lap	[V]	T	A
Explored bells	[V]	T	(A)
Turned to spin toy	[V]	T	A
Spun"cube" toy	[V]	(T)	(A)
Explored "cube" toy	[V]	(T)	(A)
Responded to teacher's voice	V	T	[A]
Explored bug toy	[V]	T	A
Looked around room	[V]	T	A
Reached for bubbles	[V]	T	A
Reached for bottle	[V]	T	A
Popped bubble	[V]	(T)	A
Bounced on ball	[V]	T	A
Crawled to "cube" toy	[V]	T	A
Explored "cube" toy	[V]	T	(A)
Put bean bags in bucket	[V]	(T)	(A)

☐ Probable Primary Channel: *Visual*
◯ Probable Secondary Channel(s): *Auditory - tactual*

Appendix 4: General Learning Media Checklist



Learning Media Assessment Form 3

GENERAL LEARNING MEDIA CHECKLIST

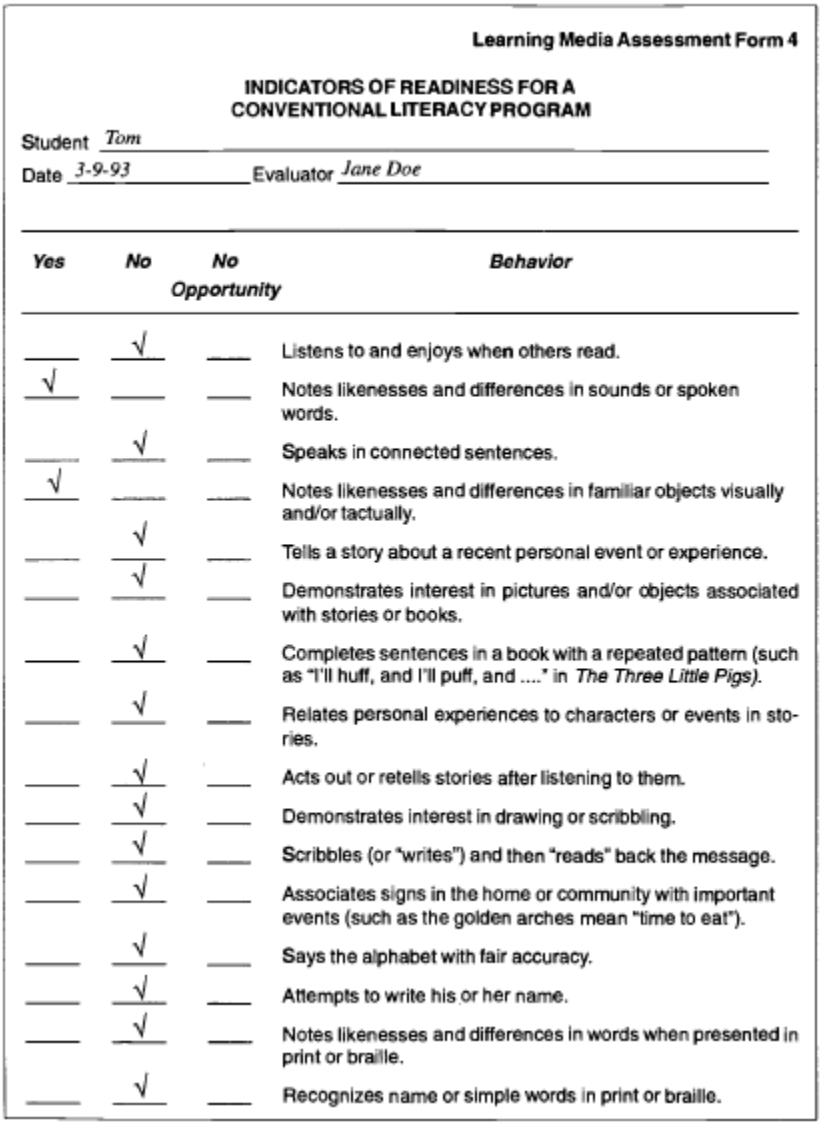
Student *Mary*

Date *2-4-93* Evaluator *Jane Doe*

Distance

Use of vision	Use of touch	Use of hearing	Learning Materials	Use of vision	Use of touch	Use of hearing	Teaching Methods
V	-	-	Pictures	V	-	-	Pointing
V	-	-	Alphabet strips	V	-	-	Gestures
V	-	-	Wall clocks	V	-	-	Facial expressions
V	-	-	Calendar	V	-	-	Demonstration
V	-	-	Felt board	V	-	-	Modeling
V	-	-	Flip chart	-	-	(A)	Oral instructions
-	-	(A)	Environmental sounds	-	-	(A)	Verbal prompts
V	-	-	Timeline	-	-	(A)	Verbal guidance
V	-	-	Number line	-	-	(A)	Verbal descriptions
V	-	-	Posters, wall maps	-	-	(A)	Questioning
V	-	(A)	Videos, movies, TV	-	-	A	Class discussions
V	-	-	Transparencies	-	-	A	Lectures
-	-	(A)	Tapes, records, CDs	V	T	A	_____
V	T	A	_____	V	T	A	_____
V	T	A	_____	V	T	A	_____
V	T	A	_____	V	T	A	_____
V	T	A	_____	V	T	A	_____
V	T	A	_____	V	T	A	_____

Appendix 5: Indicators of readiness for conversational Literacy program



Learning Media Assessment Form 4

INDICATORS OF READINESS FOR A CONVENTIONAL LITERACY PROGRAM

Student *Tom*

Date *3-9-93* Evaluator *Jane Doe*

Yes	*No*	*No Opportunity*	*Behavior*
___	√	___	Listens to and enjoys when others read.
√	___	___	Notes likenesses and differences in sounds or spoken words.
___	√	___	Speaks in connected sentences.
√	___	___	Notes likenesses and differences in familiar objects visually and/or tactually.
___	√	___	Tells a story about a recent personal event or experience.
___	√	___	Demonstrates interest in pictures and/or objects associated with stories or books.
___	√	___	Completes sentences in a book with a repeated pattern (such as "I'll huff, and I'll puff, and ...." in *The Three Little Pigs).*
___	√	___	Relates personal experiences to characters or events in stories.
___	√	___	Acts out or retells stories after listening to them.
___	√	___	Demonstrates interest in drawing or scribbling.
___	√	___	Scribbles (or "writes") and then "reads" back the message.
___	√	___	Associates signs in the home or community with important events (such as the golden arches mean "time to eat").
___	√	___	Says the alphabet with fair accuracy.
___	√	___	Attempts to write his or her name.
___	√	___	Notes likenesses and differences in words when presented in print or braille.
___	√	___	Recognizes name or simple words in print or braille.

Appendix 6: Interview Guide or Stakeholder

A. Demographic information

Name: ……..

Position: …… District (s): …….

Sex: …… Phone: …….

Number of learners registered for modified exams:

Large print: Boys ☐ Girls ☐

Braille: Boys ☐ Girls ☐

1. What are the current assessment methods do use to determine the learning media of learners with disabilities?

   _____

   _____

2. What is the criterion do you use to verify learners who are eligible for modified Examination?

   _____

   _____

3. What assessment instrument do you use when conducting Learning media Assessment?

   _____

   _____

Appendix 7: INTERVIEW GUIDE FOR TEACHERS/SPECIALIST TEACHERS

A. Demographic information

Name: …….

Specialization if any: …….

Sex: …… Phone: …….

School: …… District: …….

Highest qualification: …….

Experience in working with learners with disabilities: ……

1. Have ever assigned different learning media to learners with disabilities?

   _____

2. If yes, how do you determine the learning media of learners with disabilities?

   _____

   _____

   _____

   _____

3. What are the areas that you assess when conducting a Learning media assessment?

   _____

   _____

   _____

   _____

4. What instrument do you use when conducting Learning media Assessment?

   _____

   _____

   _____

5. How do you assess the learning media of Learners with disabilities in your class? *Give as many ways as you can.*

   _____

   _____

Appendix 8: Learning Media Assessment Instrument Item Pool

LEARNING MEDIA ASSESSMENT ITEM POOL

NOTE: The information collected through this instrument is for academic purposes only.

To be used by Assessor (EXPERTS)

PART A

Name of the Assessor:

_____

Organisation/ School:

_____

Highest qualification:

_____

Designation:

_____

_

Contacts:

_____

____

PART B

Instructions

Tick where it is appropriate for each item. Do the following items correlate with the underline domain? E.g. item 1 correlates with sensory channel.

KEY: SA = Strongly Agree

A = Agree

N = Neither agree nor disagree

DS = Disagree

SDS = Strongly Disagree

Sensory Channel Assessment

NO	ITEM	SA	A	N	DS	SDS	COMMENT IF ANY
1	Does the learner have an unstable eye condition?						
2	Does the learner have additional disabilities?						
3	Does the learner have an intact central visual field?						
4	is the learner able to describe distant objects?						
5	Is the learner able to describe near objects?						
6	Is the learner able to change fixation between near and far objects?						
10	Does the Student dislike tasks that require sustained visual concentration?						
11	Can the student discriminate shapes?						
12	Point, look, or touch a near target or item upon request?						
13	Does the learner have a visual acuity of less than 6/18?						
14	Does the learner have a visual field of less than 20 degrees?						
15	Does the learner differentiate the pitch of sounds or spoken words?						

16	Does the learner use gestures or signs, when communicating in class?						

Functional Vision Assessment

NO	ITEM	SA	A	N	SD	SDS	Comment if any
17	Does the Learner know that he/she has problems with his/her vision?						
18	Is the Learner able to attend to objects?						
19	Is the Learner able to reach and pick objects?						
20	Is the Learner able to maintain gaze on a rolled object?						
21	Is the Learner able to track an object?						
22	Is the Learner able to shift gaze from one object to another?						
23	Is the Learner able to imitate body gestures?						
24	Is the Learner able to identify and copy facial expressions?						
25	Is the Learner able to match objects by size?						
26	Is the Learner able to recognize actions in pictures?						
27	Is the Learner able to identify objects in complicated pictures?						

28	Is the Learner able to match abstract figures?						
29	Is the Learner able to match numbers?						
30	Is the Learner able to match shapes with inner details?						
31	Does the learner attend to bright light?						
32	Does the child attend to high-contract materials?						
33	Does the learner attend to bright colours?						
34	Is there a delayed visual response?						
35	Does the learner's functional use of vision fluctuate?						
36	Does the learner use tactile cues to identify objects?						
37	Does the learner use environmental cues to identify objects?						
38	Does the learner use auditory cues to identify objects and people?						
39	Does the learner use visual cues to identify objects and people?						

Literacy Media Assessment

NO	ITEM	SA	A	N	DS	SDS	Comment if any
40	Does the learner use Braille for reading and writing?						
41	Does the learner use print to accomplish other prerequisite reading skills?						
42	Is the learner able to attend to and respond meaningfully when others read?						
43	Does the learner demonstrate an association of pictures or objects with stories or books?						
44	Is the learner able to copy work from the chalkboard to his or her excises book without assistance?						
45	Is the learner able to copy from the book without assistance?						
46	Does the learner prefer reading at a distance of less than 10 cm?						
47	Does the learner prefer a text size of less than 12 N?						
48	Does the learner prefer a text size of more than N 36?						
49	Does the learner have a reading stamina of less than 5 minutes?						
50	Does the learner show more interest in pictures than the text?						
51	Does the child have a normal speed when reading?						

Appendix 9: Learning Media Assessment Instrument Evaluation Form

You are provided with the Newly developed Learning Media Assessment Instrument. Would you please comment or give remark against each item concerning the instrument. You are also free to give any suggestion on what you think could be the best for the instrument.

AREA	COMMENT
Layout of the instrument	
Grammer	
Spellings	
Use of words	
Font	

General remarks:

_____

_____

_____

_____

Evaluated By: _____

Appendix 10: LEARNING MEDIA ASSESSMENT INSTRUMENT

Preamble.

Name of the Student:

_____

Sex: M/F_____ Student ID:

_____

Date of Birth: _____ Class:

_____

School: _____ Education Zone:

_____

Education District:

_____

Instructions: to be completed by teachers/specialist teachers

Tick where applicable for a particular Learner

PART A: SENSORY CHANNEL ASSESSMENT

Tactile assessment		**yes**	**No**	**Don't know**
1	Does the Learner solely use tactual cues to identify objects?	o	o	o
2	Does the learner identify and discriminate between different using touch?	o	o	o
3	Does the learner show preferences to the specific tactile learning materials or texture?	o	o	o
4	Does the Learner discriminate shapes tactually?	o	o	o
Auditory assessment				
5	Does the learner follow verbal instructions?	o	o	o
6	Does the learner differentiate various sounds in the environment?	o	o	o
7	Does the learner recall spoken information accurately?	o	o	o

8	Does the Learner use auditory cues to identify objects and people?	o	o	o
9	Does the learner use gesture or signs, when communicating in class?	o	o	o
Visual assessment				
10	Does the learner Point, or look at a near target or it?	o	o	o
11	Does the learner solely using visual cues to identify objects and people?	o	o	o
12	Does the learner use multiple senses to complete a task? (Tactile, auditory, vision and kinaesthetic)	o	o	o

PART B: FUNCTIONAL VISION ASSESSMENT

Visual acuity		**Yes**	**No**	**Don't know**
13	Does the learner able to recognize and comprehend work on the chalkboard?	o	o	o
14	Does the Learner able to identify objects at a distance?	o	o	o
15	Does the Learner Identify near objects?	o	o	o
Fixation				
16	Does the Learner able to change fixation between near and far objects?	o	o	o
17	Does the Learner able to respond to changes in lightening conditions such as low light or glare?	o	o	o
18	Does the learner adapt to changes in lighting (illumination) conditions when transitioning between indoor and outdoor activities?	o	o	o
Visual field				
19	Does the Learner have blind spot or restricted central visual field?	o	o	o
20	Does the Learner be able to detect objects or moving objects in the peripheral visual field?	o	o	o

21	Does the learner maintain gaze on rolling objects?	o	o	o
22	Does the Learner able to differentiate between low contrast materials?	o	o	o
23	Does the learner use environmental cues to identify objects?	o	o	o

PART C: LITERACY MEDIA ASSESSMENT

Literacy materials		**Yes**	**No**	**Don't know**
24	Does the learner use Braille for reading and writing?	o	o	o
25	Does the learner use print to accomplish other prerequisite reading skills.	o	o	o
26	Does the learner able to attend to and responds meaningfully when others read?	o	o	o
27	Does the learner demonstrate an association of pictures or objects with stories or books?	o	o	o
28	Does the learner able to copy work from chalkboard to his or her excises book without assistance?	o	o	o
29	Does the learner able to copy from the book without assistance?	o	o	o
30	Does the Learner able to recognize action in the pictures?	o	o	o
31	Does the Learner able to match abstract figures?	o	o	o
32	Does the Learner able to match numbers?	o	o	o
Reading distance and font size				
33	Does the learner recognize letter or numbers at standard reading distance? (e.g between 10 cm and 30 cm)	o	o	o
34	Does the learner prefer small text size when reading? (e.g less than N12)	o	o	o

35	Does the learner prefer large text size when reading? (e.g N36 and above)	o	o	o
Efficiency in Reading				
36	Does the Learner experience visual fatigue for prolonged visual tasks	o	o	o
37	Does the Learner have a normal reading speed during reading activities?	o	o	o
38	Does the Learner able to identify objects in complicated pictures?	o	o	o
Background colour				
39	Does the Learner prefer High contrast colours of text and background.	o	o	o
40	Does the learner prefer coloured print?	o	o	o
41	Does the Learner prefer bright coloured pictures?	o	o	o

Remarks……

……

……

Assessed by:

_____

Signature: _____ Date of Completion:

_____