

**UNIVERSITY OF RWANDA**

**COLLEGE OF EDUCATION**

**FACTORS INFLUENCING THE PERFORMANCE IN MATHEMATICS AT  
GATAGARA SPECIAL SCHOOL FOR VISUALLY IMPAIRED LEARNERS IN  
RWAMAGANA DISTRICT, RWANDA**

**BY**

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## **CERTIFICATION**

This is to certify that the dissertation entitled “Factors influencing the performance of learners with visual impairment in the subject of Mathematics” was carried out by Donatilla M. KANIMBA under my supervision in fulfilment of the Requirements for the award of Master of Education Leadership and Management (ELM). In School of Education, department of Foundation, Management and curriculum studies during the academic year 2015-2016.

Supervisor: Dr Beth MUKARWEGO Nasiforo

Signature.....

Date...../...../.....

**DECLARATION**

I, Donatilla M. KANIMBA agree that this is my own work and it has never been published by any other person. The research is supported by the information from other authors who have been acknowledged.

Donatilla M. Kanimba

Signature.....

Date...../...../.....

## **Dedication**

I dedicate this work to my family and colleagues at work who supported me throughout my study period and during the time of writing this dissertation.

## **Acknowledgement**

In these few lines, I would like to acknowledge the support and understanding of the University of Rwanda towards me as a student with visual impairment, my Lecturers, especially those who took the extra initiative to make sure that I got information and materials in Braille. I wish to thank my supervisor for her constant guidance and support in developing research and all the way through even to the collecting of my final draft.

I wish to acknowledge the dedicated support of my sighted assistant Nyirabarera Rachel who tirelessly travelled with me during data collection and helped me throughout all the work of putting together this dissertation.

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## **ABSTRACT**

The main aim of this work was to find out the factors influencing the performance of students who have visual impairment, in Mathematics at O-level in the HVP Gatagara Rwamagana.

Objectives of the study:

1. To find out reasons for poor performance of learners with visual impairment in the subject of Mathematics
2. To determine the role played by students where their performance in Mathematics is concerned
3. To determine the part of teachers in the poor performance of students with visual impairments in mathematics.
4. To demonstrate the role of the school environment in the performance of learners with visual impairment in Mathematics

The study was conducted in the Eastern province, Rwamagana district, Kigabiro sector, Nyagasenyi cell and Rusave village, HVP Gatagara Rwamagana school. In this work, the target group was, all students from ordinary level who were 173, 35 teachers, the deputy of studies and the principal, the whole population was 210 persons. The sampling size was 18 students from senior three who all have visual impairment, 15 students participated, 3 teachers, head teacher and deputy of studies. They were selected by using Stratified random sampling strategy. Data were collected by using questionnaires and interview. Questionnaires were for students and teachers while interview was for Deputy of Studies and principal.

The results of the work demonstrated that students who have visual impairment score poorly in Mathematics because of the following factors: insufficient teaching and learning resources such as textbooks in braille and other Mathematical materials used by students who have visual impairment, low skills of tutors in teaching Mathematics to students who have visual impairment, low self-esteem of students themselves where Mathematics is concerned. To rectify this situation, it would be necessary to provide students who have visual impairment with text books in braille or large prints, Mathematical materials such as boards and types or cuberithms, the appropriate geometrical sets and any other equipment which could help students who have visual impairment to understand and master the course. It would be

necessary to provide the Mathematics teachers with sufficient knowledge of the materials they will be using in teaching students who have visual impairment and sufficient skills in braille reading and writing.

## **LIST OF ABBREVIATIONS**

VI: Visual Impairment

CWVI: Children with Visual Impairment

CWDs: Children with Disabilities

EFA: Education for All

IEP: Individualized Education Plan

MOEVT : Ministry of Education and Vocational Training in Rwanda

UNESCO: United Nations Educations, Scientific and Cultural Organizations

UNCRPD: United Nations Conventions on the Rights of Persons with Disabilities



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## **CHAPTER ONE: GENERAL INTRODUCTION**

### **1.1 Introduction**

Research was to look at the factors that influence the performance of students who have visual impairment in Mathematics. This section shows the background to the problem, statement of the problem, objectives of the study, research questions, significance of the study, scope and limitation of the work and meaning of terms.

### **1.2 Background to the problem**

Mathematics is often considered a very difficult subject, whether at the lowest or the highest levels of education. Mathematics as a subject has been studied since time immemorial, right from the ancient civilization to the present. Martha Stillman (2014), traces the use of Mathematics in its formal sense as far back as 3200 BC around Mesopotamia and Sumer while other civilizations in Egypt and China also developed their own Mathematic codes, years after. The theories of Pythagoras and Archimedes are still in use today. In more modern times, technology has eased some of the tedious work in calculations but Mathematics still remains quite a difficult subject especially to those who have visual impairment. This does not however mean that it would not be possible for a person with visual impairment to be a good mathematician.

That Mathematics can be difficult for learners with visual impairment is indeed true the world over. According to Giesen, Brenda, Cavanaugh and Capella (2012), Mississippi State University, “unwell Mathematics academic standards in students with some degree or no useful vision has long been a concern of blindness practitioners, authorities, guardians, and consumer groups”. Beal and Erin (2008), pge 1 from California in their work, working memory and Math problem solving by blind middle and high school students, Implied that achievement in math by blind students tend to be poor relative to performance in other academic subjects: Blind students face multiple challenges in math problem solving including gaining access to the problem information, mapping the problem information to the appropriate representation and providing the resulting answer.

Maguvhe (2015) pge4, University of South Africa“Showed in his study, that teachers were not suffieciently trained to teach the blind and partially sighted learners and lacked the necessary innovation where resources for the teaching of science and mathematics were limited”.

Zbiek in his research (2017), finds that students who have visual impairment encounter many difficulties in learning Mathematics. This conforms with Mwangi's findings (2006) from Department of Special Needs Education in Kenyatta University who conducted research on problems met by Mathematics teachers of students with visual impairment at Thika elementary school for the blind, Kiambu county Kenya. She found that students who have visual impairment have difficulties in learning Mathematics due to many barriers such as Low qualification of teachers, inadequate teaching and learning resources, inappropriate teaching methods, low expectation of teachers to the performance of learners with visual impairment.

In Rwanda, the government was not left behind in signing and adopting the various convention and treaties upholding the rights of person with disabilities including the United Nation Convention on the Rights of Persons with Disabilities (UNCRPD). However, education for learners with special educational needs in Rwanda still remains for the most part in the hands of church based organizations. The schools are themselves expected to determine how they deliver the education and must find the materials they need, to provide the education. This is usually not so easy as the researcher found out because materials such as those needed in teaching mathematics cannot be purchased from the regular markets or bookshops.

As the researcher sees it, in this century which is characterized by globalization and greater advancement in technology, education must be the way to bring every individual update with the trend. It is through education that human capital is developed which leads to the well-being of the general population.

According to the researcher, the idea of developing the human capital also means that we must consider that we are expected to develop the human capital even when the individual in question may be having some form of impairment which may alter the level of functional ability or make it necessary for the person to adopt alternative ways of performing certain functions.

The rights of persons with disabilities are discussed in many treaties and declarations where socio-economic, political and educational rights are the core issues.

Inclusion of students who have disabilities into the education system started centuries ago in developed countries but is now growing steadily in African countries including Rwanda as

leaders become more conscious of the benefits of inclusion for students who have disabilities.

In the past, education for students who have disabilities was carried out in segregated specialized institutions. This was the model that was introduced in Africa during the 20<sup>th</sup> century. This model proved quite expensive and could only reach a limited number because these institutions were usually residential and far apart.

Orodho (2009) states that “there must be equal chances in education for all, each person is born with a given amount of potentials, educational systems should be formulated in the way of removing obstacles of any kind. For instance, obstacles based on factors related to social, economic, geographical, school and any other factor which prevents students who have disability in the education area to take benefit of their inborn abilities because disability is not the lack of ability”.

Basing on the research conducted in 2019 by Dimitris from Southern Illinois University Carbondale & James from University of Virginia, page 8, Article 24 of the United Nations Convention on the Rights of persons with disabilities which deals in great length, on the right to education for persons with disabilities “on equal basis” with others. It states clearly the need for equity and quality of education irrespective of whatever disability the person might have. This raises emphasis on the need for “reasonable accommodation” which will include all possible measures needed to make it possible for persons with disabilities to gain full inclusion.

EFA disability ‘flagship’ an attempt which draws global special attention to the fact that education is a fundamental human right which cannot be achieved without including all children who have any form of disability. Education however will not be complete for a child who will only learn some subject and leave out others. This is in many instances the case for learners with visual impairment where Mathematics is concerned, World Bank (2004), page 4.

From the above summary, people with disabilities are recognized and valued in the same way as others.

This work sought to find out the factors affecting low grade performance for visually impaired learners in the subject of Mathematics at HVP Gatagara.

### **1.3 Statement of the problem**

Education of students who have special needs was in past years delivered in segregated residential schools (special schools). In recent years, some are included in ordinary institutions where they sit and study together with their peers who have no disabilities.

Students with special needs in education meet with many challenges whether in special schools or in inclusive schools as it was said by Kamau in his thesis of 2015 “In the last few decades, education provision for learners with special needs has changed. More learners with special needs are studying side by side in regular schools with their peers who do not have special needs. Inclusion could be influenced either positively or negatively by institutional factors such as school and the surrounding environment, teaching/learning resources, support services among others. These factors may create barriers towards effective inclusion of learners with special needs. However, if proper intervention is done the learners with special needs would be included with little or no problems”.

This study focuses on the factors affecting the poor outcome for learners who have visual impairment in the subject of Mathematics. While the course of mathematics is quite easy for those who are fully sighted, it can be quite difficult for those who are blind or partially sighted because many mathematics related concepts are demonstrated graphically and consequently many concepts remain unexplored by touch Kalra Lauwers, Dewey , Stepleton & Dias (2009). This shows that students who have visual impairment meet with a great number of problems in their studies especially in the subject of Mathematics which means that there must be special interventions that will help them to access quality education.

According to Jackson (1968), there is no irresistible reason why a person of sufficient potential should fail to become a prosperous mathematician just because he or she is sightless.

The researcher selected this topic after looking at the academic standards of students who have visual impairment in HVP Gatagara Rwamagana where their results from national exams were poor. Taking an example of their performance in two years: 2014 academic year, 19 students sat the O- level exam, where all of them got the lowest grade (9), in the year 2016 the same school out of 14 learners who sat the O-level exam only one student got 6<sup>th</sup> grade while the rest only managed 9<sup>th</sup>. In conversation with teachers from the school, the researcher found that they too are concerned about the poor academic standards of their learners in Mathematics. This motivated the researcher to take up this topic.



#### **1.4 Purpose**

The aim of this work was to investigate the factors affecting the performance in Mathematics of students with visual impairment at Gatagara special school for visually impaired learners in Rwamagana district, Rwanda.

#### **1.5 Objectives of the study**

The following objectives guided this study

1. To find out reasons for poor performance of learners with visual impairment in the subject of Mathematics
2. To determine the role played by students where their performance in Mathematics is concerned
3. To determine the part of teachers in the poor performance of students with visual impairments in mathematics.
4. To demonstrate the role of the school environment in the performance of learners with visual impairment in Mathematics

#### **1.6 Research questions**

1. What are the causes of low performance in Mathematics of learners who have visual impairment?
2. Is there any contribution of students who have visual impairment in their low performance in Mathematics? What could be their role?
3. What could be the role of teachers in the performance of learners with visual impairment in Mathematics?

#### **1.7 Significance of the study**

The significance of the study lies in the fact that there has not been a similar study on this topic before, yet the problem of poor performance in Mathematics for learners who have visual impairment has been persistent.

The research findings will help policy makers, teachers, curriculum designers, ministry of education, future studies and other educational participants to pay attention in their plan for improving the performance of the learners who have visual impairment in Mathematics.

Seeing that, Mathematics has a big role in the academic standard and understanding of other subjects and in daily living, the research will find out the causes of low academic standards in the course for students who have visual impairment and measures taken to improve their performance.

Teachers will benefit from the study as many of the problems they encounter when assisting learners who have visual impairment will be identified and solutions proposed. This will also make it possible for relevant authorities to plan strategies to deal with the problem.

The curriculum designers will also benefit from the study because they will become aware of the factors that affect the poor academic standards of learners who have visual impairment in mathematics and include adjustment that will help both the learners and teachers to ensure that the performance of these learners is satisfactory.

The Ministry of education will improve the way they provide support which help learners who have visual impairment to have access to quality education like others without disabilities, for example increasing of budget provided, follow up of performance for those learners and so many others.

Lastly, future studies will benefit from this work as it will be used as reference.

## **1.8 Scope and limitation of the study**

### **1.8.1 The scope**

The research will focus on the factors affecting the low grade performance in Mathematics for students who have visual impairment at O-level (Tronc commun) in the HVP Gatagara Rwamagana, lasting three months from 15<sup>th</sup> March to 30<sup>th</sup> August 2018

### **1.8.2 Limitation**

Limitations of the study will include problems that will arise during the progression of the research

It was not possible to investigate all factors that influence performance in Mathematics for all students who have visual impairment due to time and materials required for the research.

## **1.9 Definition of terms**

**Impairment:** means the loss or reduced function of body organ Heward (2013).

Visual impairment: refers to both blindness and low vision. Educationally, a student who has low vision is an individual who has some low vision, and therefore can read big prints or use visual aids such as magnifies. On the side, an educationally blind learner is an individual who has very limited vision and thus depends on reading and writing by utilizing the braille system or by using audio tapes Mastropieri & Scruggs (2010). Here the researcher prefers to add blind child is not just one who has very limited vision but some also have total loss of vision.

**Poor Performance:** It is used in the work to mean the situation where performance is not up to expectation, Kamau (2015).

In conclusion, the first chapter contains data on the topic of the work, the reason of research and its aim. As discussed by Martin J Giesen (2012), learners who have visual impairment are faced with considerable barriers when studying Mathematics which have effects on their performance. The researcher will be investigating some of these barriers. More details will be discussed in the following chapters.

## **CHAPTER TWO: LITERATURE REVIEW**

### **2.1 Introduction**

The second chapter emphasized on empirical literature review, theoretical framework and conceptual framework

### **2.2 Empirical literature review**

Empirical literature review deals with ideas from other authors on the factors affecting performance of learners who have visual impairment in the subject of Mathematics.

“Visual impairment is the accepted generic term that refers to all levels of vision loss. Visual impairment does not equal always blindness but also vision loss that can make it difficult or impossible for a person to do some things. Visual impairments can be caused by a multitude of factors including disease, accidents and congenital illnesses or conditions. There is a difference between the needs of visually impaired individuals and blind people” NEADS (2015). Depending on degree of loss people with visual impairment need different types of support to perform their tasks.

Teaching mathematics help students to use and organize their thoughts which they get from activities and communications with their societies. As Csocsan, Klingenberg (2002) said that, “the main goal of mathematical education is to develop an awareness of numbers and coping with different relations and dimensions. The most frequent mathematical problems of blind pupils are as follows:

Generalizing – finding the similarities in different activities in everyday life,

Translating activities and actions into mathematical language

Lacking flexibility in problem solving and in calculations

Translating and transferring three-dimensional objects into two-dimensional iconic forms, example: The blind pupil find it hard to conceptualize a geometrical

drawing of a cube from a perspective view because of his/her lack of visual experiences. S/he may find it hard to understand enlarging and minimizing two dimensional forms.” Even though it is not easy to explain mathematical drawings on paper to learners who have visual impairment, it is possible when the teacher works hard by using tangible drawings or concrete materials

Learners who have visual impairment fail to score well in Mathematics because of many factors which discourage them such that most of them do not opt for the subject in the upper level due to lack of motivation. “Most of these learners do not take mathematics and sciences mostly because they have the belief that these courses are not appropriate to them. “The underlying problem is that often the teachers themselves do not have adequate direct experience with teaching blind and partially sighted learners” Sahin (2009)

“ In cases where apparatus have been modified for use by blind and partially sighted learners and information presented in accessible formats, this group of learners have been observed to perform competitively with their typically sighted counterparts” Sahin (2009). As it was said by Manguvhe in the journal of disability Published online 2015 Nov 4. “the main reason why blind and partially sighted learners are unable to participate in sciences and Mathematics in large numbers is more about the lack of appropriate access technologies and teachers’ attitudes than about intellectual incapacity of blind and partially sighted learners themselves”

The situation in which the education occurs, strict program and unsuitable evaluation processes are some of the aspects leading to unsuccessful learning amongst students who have visual impairments Maguvhe (2008).

Ndururno (1993) “asserts that learners with loss of sight in mainstream schools experience a number of difficulties. One, these learners find themselves in a strange world where they seem to be strangers among their sighted peers who in most cases are the majority and lack awareness on visual impairment. In most cases, the blind learners are largely obliged to learn by listening and occasionally by touch”. This often arouse for some wiled imagination which will not be helpful to the child learning.

As indicated by Barraga (1993), “Learners who have visual loss do have a considerable challenges in accessing relevant reading materials because they are not available in braille or audio, this may make it necessary for the learners who have visual impairment to solicit help of sighted readers to access the textbooks.

Corley (1989) explains that it is not easy for a visually disabled learner to acquire the concept of size and weight without using touching. A sighted scholar can simply get an idea of the mass of an object just by detecting or observing at it. But it is not similarly easy for the visually impaired to come to the same conclusion without using his residual senses. This problem similarly smears to the concepts of size and height.

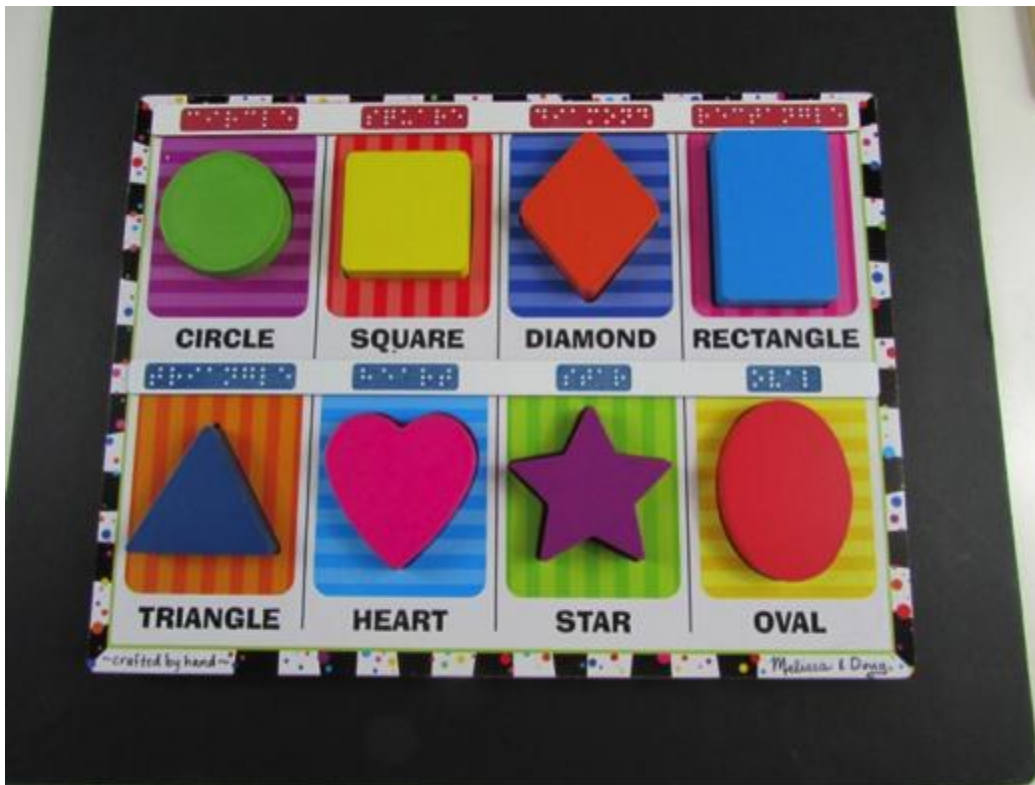
**Figure 1. Objects with different shapes and sizes**



Source: [www.perkinslearning.org](http://www.perkinslearning.org)

All said and done, numeracy is a right and a necessity for every human being and children must start to learn it at the earliest possible age. In a research held by Texas University for the Blind and Visually Impaired (2006), the researcher compares the way in which children with normal vision understand Mathematical concepts compared to those who have visual impairment. The work shows that, while sighted children have the advantage of being able to compare sizes and shapes of objects simultaneously those with visual impairment have to deal with each object or drawing separately before coming back to compare. This shows that they have more to deal with but it does not mean that they are less able to understand Mathematics.

**Figure 2. Objects with different shapes and sizes marked with braille**



The researcher agrees with Pauline (2003) that use of concrete objects is essential in helping learners who have visual impairment to comprehend size and shape of objects or figures. It offers some interesting suggestion in coaching young children with visual impairment. motivate children to examine bunches of items which can be recognized with one or two hands (e.g., coins, candy, beads, buttons,) to compare the relative size of groups of things.

- Give good chances to match number of items to number of fingers.
- Talk about figures: how many, how many more or less, how many more are required.
- Allocate number names to bunches of items which are unlike in size or shape for experience with the concept of amount and comparison of quantity. (A research hosted by Impaired (2006)

**Figure 3: Objects that help learners with visual impairment to understand quantity in containers of different shapes**



Source: [www.patstoliteracy.org](http://www.patstoliteracy.org)

To reduce the problem of educational materials scarcity, teachers should use available local materials as most materials are expensive and difficult to find.

Availability of teaching/learning materials inevitable affect Performance of students who have visual impairment. For learners and teachers to participate actively in the learning and teaching process, institutions must ensure that teaching and learning resources are made available and used for all the learners including those who have special needs conferring to their needs Moodley (2012).

“In each classroom, students differ in their capacity; there are slow, middle and fast learning students. Slow students learn from their colleagues who are more skilful or ahead. As in Vygotsky theory (1978) More Knowledgeable Others (MKO), in the classroom a learner who is faster facilitates his/her fellow to understand complicated chapters”.



“Cooperative learning is a good strategy of teaching students with visual impairment, particularly in the mixed ability groups. It is especially important in third world countries where classes are very large” Mitchell (2008)

Learners with visual impairment experience many barriers which is why teaching them by using concrete materials is the best way to develop the function ability of the remaining senses. According to Lydia (2014), “teaching of Braille and other tools where the remaining senses take the place of sight is the only obvious and acceptable attempts to meet the needs of the learners with visual impairment. Special provisions to this group of children must take into consideration all implications of perceptual restrictions which go far beyond adaptation of tools”.

Learners with visual loss need special methods which include the use of concrete material in helping them to be familiar with the surrounding environment. For example, in teaching young beginners with visual impairment, the teacher would need to use objects to hold in the hand in teaching a child to count or moulded objects to help a child to understand shapes of real objects such as animals and equipment.

Lydia (2014) continues, Learners with visual impairment depend for the most part on their tactual and auditory understanding and kinaesthetic experiences.

While auditory sense gives some cues regarding where and how far, it does not give a clear impression of structure and shape. The key role of auditory sense to a child who is blind to support verbal communication and help in walking around. The auditory sense as such is not very valuable in the acquisition of concrete cues of shape and size for a child who is blind.

While dealing with students with vision loss, it is important to understand that they have limited experience of objects and other things that do not occur to them in every daily life. Different types of leaves, plants, rhizomes, and the like may prove difficult to conceptualize. “Concrete examples of real objects, tangible drawings or paper cuttings would prove very useful” Pauline (2003)

Mastropieri & Scruggs and Spungin (2002,2010) both have something to say about giving extra time to students with visual impairment, during examinations when they are expected to answer questions it takes longer to understand a figure or an object when using the senses of touch. In the same way it takes more time to read braille or large print.

It is therefore necessary to give double time for readers of braille and increased time by half for large print users.

To assess learners is the logical approaches of collecting and classifying appropriate necessary information concerning the education on the student. The key goal is to know the particular requirements of the learner McLoughlin & Lewis (2005).

Spungin (2002) underscores the importance of assessment and clear understanding of students' academic capability and the importance of parents and peers in educational setting. He states that "Quality teaching and learning can only be achieved when student's background and prior knowledge is assessed and known. Assessment of the learning needs of a student with visual impairment is important for both learner and the teacher. This is because it allows for an understanding of the learners' academic ability, learning styles and learning needs"

All information concerned with students learning should be recorded and shown in the Individualized Education Plan (IEP) McLoughlin & Lewis (2005)

Educators often find it difficult to support their students the right kind of strategies to acquire skills and knowledge in science and mathematics. the attitudes of teachers in schools for students who are blind and partially sighted give the impression that their students lack the capability to study and excel in pure sciences. It is in fact quite true that students who have visual impairment have the same capabilities as their sighted peers Kumar, Ramasamy & Stefanich (2001).

Educational institution should have provided ease of access so that all learners, regardless of their potentials or disabilities, can walk independently around the school compound without any limitations Mitchell (1999) "The environment should provide children who have special needs with barrier free access into offices, classrooms, library, toilets, playing fields, pathways and other facilities at the schools. When the facilities are barrier-free, it makes it easy for children with special needs to interact with others academically and socially. For instance, the pathway to the playing field should be barrier free so a child with a wheelchair can go to the field during break times to play with his or her friends". Similarly, a child who have visual impairment, should be capable to move freely and independently wherever and whenever needed.

Teaching students with varying abilities is managed mainly by creating positive environment, as it was supported by Ogot (2005), “who said that accessible environment helps to keep learners with special needs in school and performing unlike where schools had inaccessible environment”.

UNESCO, UNESCO Institute for Education (UIE): annual report - UNESCO (2004) indicates that this can be achieved by constructing ramps to classroom and other school buildings, construction of adapted toilets, widening of classroom windows, making the inside of the classroom more attractive by using painting and walls hangings, levelling of the play grounds for easy movement. In addition to this, school authorities would need to mark dangerous areas proximity to doors and turning points on path to assist children with visual impairment in easy and unsupported mobility for stimulation to play, run and the active like their counterparts

“The class environment should consider the learners learning pace; hence it should be equipped with rich learning areas for learners to learn at their own pace. Conducive social environment is also encouraged. If regular schools’ environment is favorable, it becomes ideal for inclusion of students who have special needs. Schools must have conducive, friendly atmosphere which will support and accommodate all children regardless of whether they have any disabilities or not MoE&S-Uganda, Otiato (2002,2003).the child’s sense of safety will increase hence building confidence and capacity to interact with others. This will inadvertently lead to better scores in academic work.

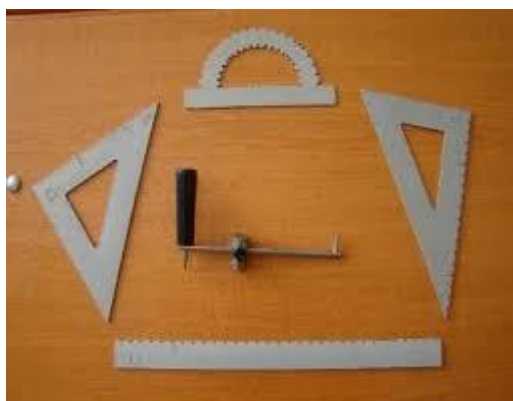
“Adaptation of teaching and learning environment is at the core of successful inclusive education. If the environment in which learning occurs is not supportive to students with visual impairments, their learning will automatically be interrupted” (Johnsen, 2001).

(UNESCO, UNESCO Institute for Education (UIE): annual report - UNESCO, 2004) goes on to state that the students must be equipped with the necessary learning aids that meet the individual needs. Randiki, Etsey (2005,2008) also agrees that appropriate teaching materials “stimulate ideas, demand and active response from the learners and provide enjoyment of lessons”. This helps to make the lessons easier and better understood by the learners while the teacher is more likely to enjoy his /her work. According to Broom (2004), “the creative use of a variety of media for learning increases the probability that students would learn more, retain better what they learn and improve their performance on the skills that they are expected to develop”.

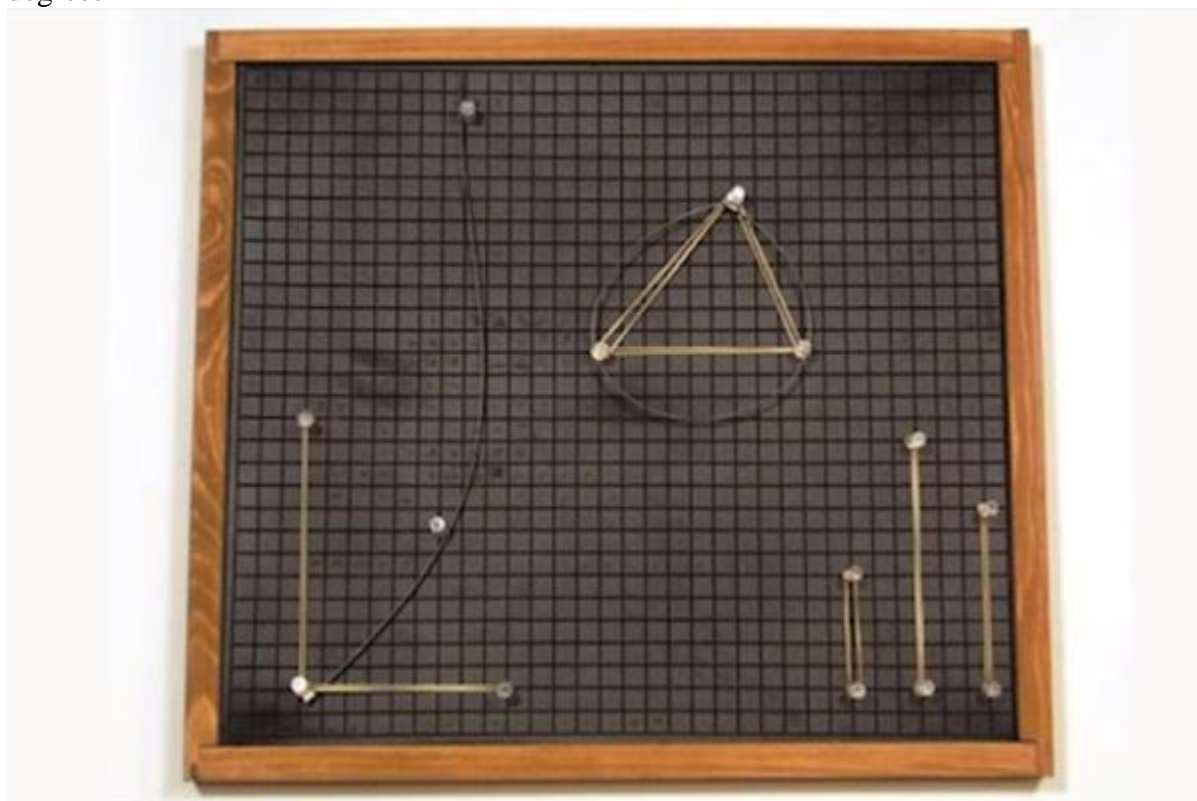
shortage of resources made the tutor and the student to inevitably bounce some mathematical works stated in the syllabus such as calculating angles using a protractor, measuring of objects using a ruler and other related tasks Tanti (2006)

### Some items that can be used in geometry

**Figure 4.** Ruler, protractor, compass, set squares



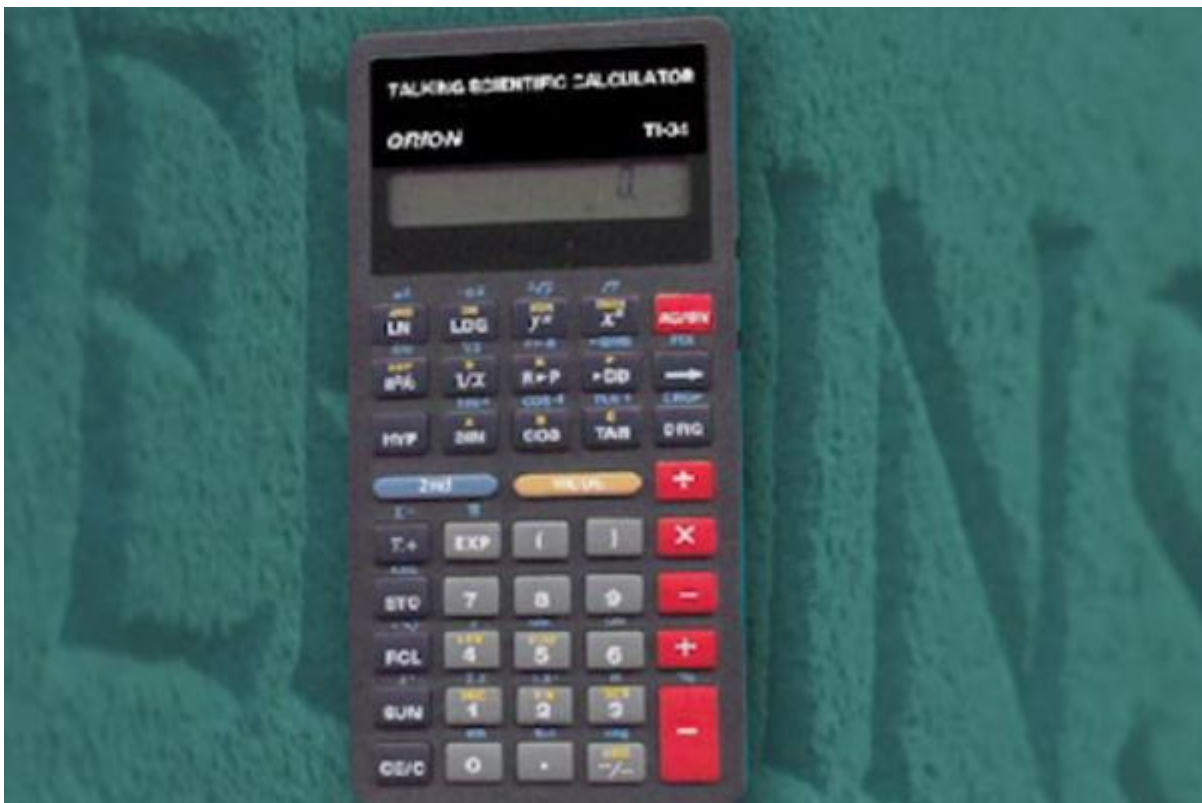
**Figure 5.** Circle with radius marked in braille, tactile lines and showing 90 degrees



**Figure 6.** 90 degrees in braille



**Figure 7.**Talking scientific calculator



Source: [Www.perkinslearning.org](http://www.perkinslearning.org)

When it comes to training of teachers special attention should be addressed to training of teachers to learners who have visual impairment (VI), hearing impairment and cognitive

challenges. Additional specialization is necessary for each of these forms of disability. Such specialization can be acquired through in-service training of teachers or through the pre-training as part of the cause work for the teacher training (Researcher' reflection).

According to Kamau (2015), Moodley(2002), in his investigation found that, when teachers are educated and get the skills to cope with the problems faced children who have special needs, they usually gain motivation in their works. Knowledge on different disabilities help them to have positive mindset towards the students.

This is indeed necessary for the teachers because as UNESCO, UNESCO Institute for Education (UIE): annual report – UNESCO (2004) puts it, “teachers can experience greater job satisfaction and a higher sense of accomplishment when all children are succeeding in school to the best of their abilities”. Hence, coaching becomes enjoyable instead of burden because tutors are given the needed skills which help them to assist learners who have special needs.

According to Kamau (2015) in his 2010 thesis, educators with specialized training preferred having students with special needs mainstreamed into regular schools than those without the training. What the training does is to make sure that the relevant intervention strategies to be applied are not repetitive, they are the right strategies and that they are being applied in the best way possible. The interventions which were previously applied were often used haphazardly. The trained tutors can now identify children with special needs and appropriately referred them to be assessed. The right kind of training and experiences gained help the tutors to select and apply the relevant teaching strategies. In the way of finding the right strategies to cope with the challenges tutors are more likely to develop better mindset and improve their approaches in teaching all children regardless of their situations. Training and experience assist them get new skills, and get experience of using various teaching methods. While looking for ways to overcome challenges, they can develop more positive attitude, and approaches towards all children and situations.

The Council for Exceptional Children England (2003) in Eastern Europe showed a great number of teachers felt that it is of great importance that teachers should be equipped with the basic skills and knowledge in dealing with children who have special needs. This should be achieved by training of tutors in special needs education.

After the assessment of learners, an Individualized Education plan (IEP) is prepared to know that all students receive the same opportunity to education quality. According to (Salisbury, 2008), IEP “is a plan of study extracted from the general curriculum which is designed specifically to meet the needs of a student with additional needs. This plan of study comprises a list of specific goals to be met and the strategies to be used to meet those goals”

(Spungin (2002), also agrees with the necessity of IEP and argue that, parents and teachers should work together in preparing

Another way of ensuring equity in education to all students is collaborative teaching. Here, a specialized teacher in the particular disability or special needs in education is in the classroom together with the class teacher to help the students with special problems This could include preparing teaching materials or ensuring that the learning environment is conducive. Thus, in a class which has a learner who has visual impairment the support teacher must be conversant with braille, braille equipment, and braille geometric set and other such materials Spungin (2002)

Parents play a big role in the education of their young, and are good sources of all information on the academic potential of learners who has visual impairments. Parents are the ones who are likely to know their children best; they would know their children’ interests and what would best capture their interest. Parents also their children needs in education. this means that parents will play a big role in planning the future for their children. They will also give needed information in the aspect of social, physical and emotional development Garner & Davies (2001). By considering this information, a tutor will struggle to structure and change his or her teaching to support learner who has visual impairments in the class Spungin (2002). The collaboration of parents in education of learner who has visual impairment is both necessary and very important.

Many years ago, learning was reflected as a result of teaching. The teachers participated actively while students follow his/her instruction passively. But as we see from Webster & Roe (1998) “an effective teaching is more than merely transmission of information from teachers to students but rather a complex interaction between the two parts”. This would mean “A paradigm shift to a more participative system teaching and learning where teacher and learner engage in active discussions allowing the teacher to understand the needs of each learner more clearly” Bowring- Carr & West-Burnham (1997)

Teaching can be quite complicated in an inclusive classroom setting. The teacher has to pay special attention to each individual learner taking into account their various diversities. Peters (2003)

Accessing information from textbooks is an essential part of school learning:

- It is crucial for better reading to be recognized well previously the start of a term, so that provisions can be made learners to access it. Waterfield and West (2008 ) It may require a recording, Braille materials, recording them or producing them in large print.
- Preparing teaching materials in format that will be accessible to learners with challenges in reading prints takes a lot of time, so previous planning is needed if the learner is to have texts offered at the beginning of the term. Waterfield and West (2008 )
- In addition, availing the suitable equipment needs time. (Waterfield, . and West, 2008 )
- It would be necessary to meet the student(s) with visual impairment or any other special needs before the start of the lesson.
- Supply the students with a list of required books and other coursework materials.

In the case of learners who has visual impairment, it is important that an annual visual assessment is carried out to a certain degree of visual acuity and making sure that the teacher understand the learner' degree of ability to read print. If the learner is a braille user, the teacher must make sure that there is sufficient support for the learner to access materials in braille and the learner develops proficiency in braille reading and writing. The teacher must make sure that all materials needed by learners in the classroom setting are made available.

Learners who have visual impairments either lack vision or they have severely limited ability to see visually, verbal communication with the tutor is key . the teacher/tutor must do the following:

Use a clear friendly voice. This means, to avoid a sharp tones that could indicate anger or impatience. Avoid monotonous boring voice , the voice of the teacher needs to be interesting to listen to. This means speech tempter, how audible and gentle can be very captivating (Best, 1992).



Another complication that learners who has visual impairment experience is when the teacher points a finger at things on the wall or screen. Mastropieri & Scruggs (2010) say something about this, tutor must use very precise statements. Statements like “over here” or “this and that” should only be when the teacher is holding the hand of learner who has visual impairment and indicating the direction.

The teacher who has a students or some students who have visual impairment must accompany writing on the board, with verbal reading of what is written Spungin (2002)

To help learners who have visual impairment to feel part of the group, the teacher should call names of students when asking questions or giving an instruction. Mastropieri & Scruggs and Spungin (2010,2002)

A learner with visual impairment depends chiefly on verbal information in their studies, special materials are very important in assisting educational process. It is also possible to provide students who have visual impairments with audio recorded lessons for future reference.

Sometimes videos are shown in class as part of the lesson. In such cases, it is more helpful to go through it with the learner who have visual impairment and make sure they understand it before presenting it to the class. It is necessary to interject brief verbal comments to give the students who cannot see the video a clear understanding of what others are seeing or have seen Spungin (2002).

Both optical and non-optical tools must be used to maximize function ability of the residual vision and better understanding of the subject matter by learners with visual impairment Spungin (2002)

### 2.3 Theoretical framework

This work was done in the line of Abraham Maslow’s Needs theory Maslow (1943). This motivational theory will be applied to the issues of association between institutional based factors and performance of learners with special needs.



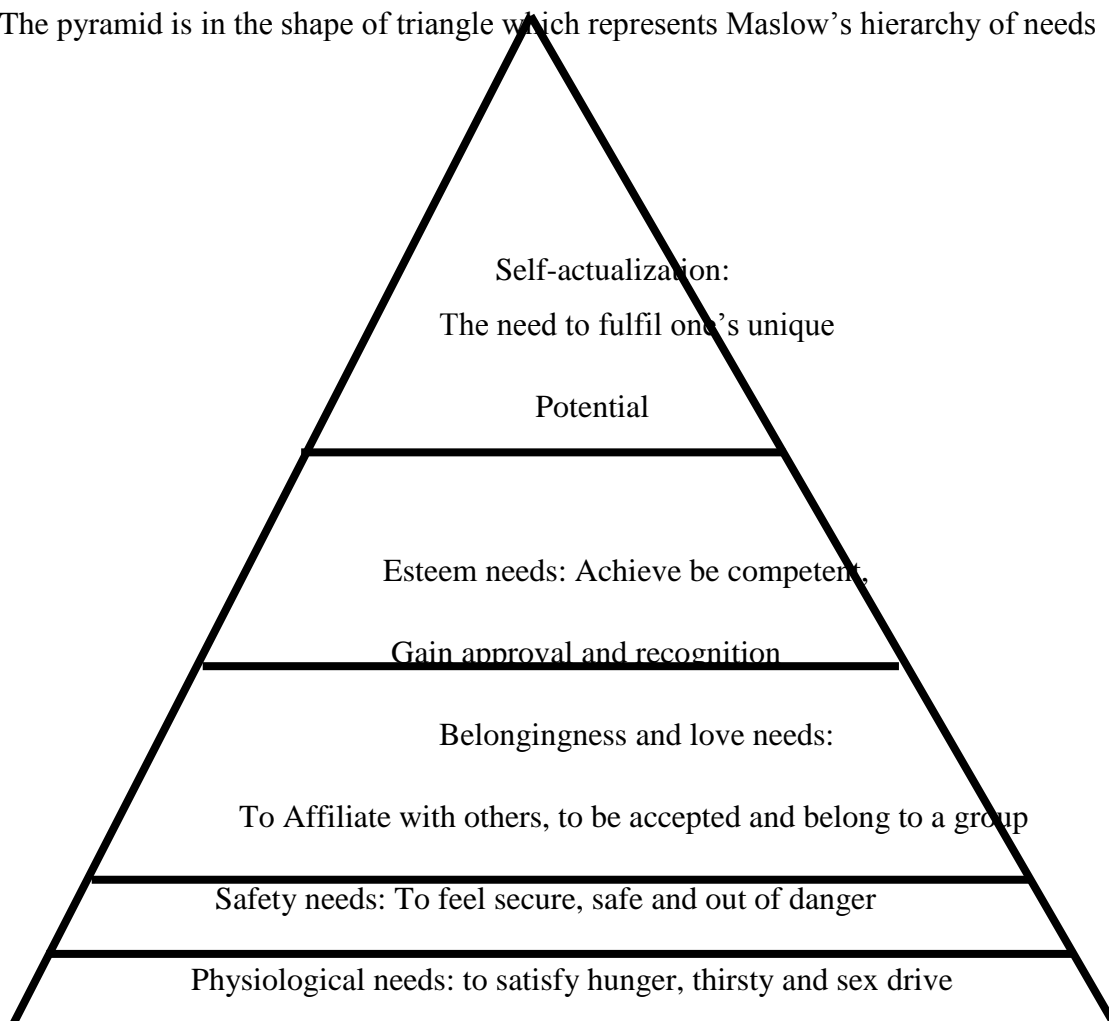
Passport size photo of Maslow

Abraham Maslow's book *Motivation and Personality* introduced the Hierarchy of Needs and believed that all members of society should be given the chance to realize their full potential as human beings. In doing so, Maslow defined five basic concepts concerning human nature.

### **The pyramid of Maslow's hierarchy of needs**

In Maslow's view, main needs must be met before a person is free to get physiological needs. This process is the same for other levels.

The pyramid is in the shape of triangle which represents Maslow's hierarchy of needs



### **Physiological needs**

As seen in Maslow's pyramid of needs, physiological necessities are paramount and taking first priority. Food and drink, oxygen, body warmth and other biological needs must be satisfied first up to a comfortable point before we think of what next

### **Safety needs**

In this same pyramid of needs, safety needs take second position in importance. Bad build nests, Lions, find caves (dins) etc. All animals must find ways to be sure that they are safe. Similar it is of crucial importance that children feel safe in order to move about and ply freely with no fear of pain or injury. Children with visual impairment need the extra care of knowing that they will not fall or run into objects. It is equally important that they should be able to play without cumbersome restrictions of over protective guides.

### **Love and belongingness need**

The need for love and belonging is very often frustrated "thwarted" or distorted in expressing it for children/persons with disability. Instead of allowing the young people who have disability to mix freely with others and make friends, they are segregated and overprotected believing this to be expression of love.

### **Esteem Needs**

The self-esteem needs are key in building ambition and competitiveness in life when satisfied. According to Maslow it builds "Humans experience as a strong desire for reputation and prestige, for recognition and attention, for feeling and being important, useful and appreciated by the society. If this need is satisfied the effect is feeling of self-confidence. And high self-esteem. Failure to satisfy this need brings about feeling of inferiority, weakness and helplessness". A student with visual impairment who always gets the lowest marks in mathematics or who is not allowed to attempt the subject may feel less good or less competitive.

### **Self-actualisation needs (creativity, justice)**

At the top of the pyramid, is self-actualization, different people may reach varying degrees of self-actualization depending on opportunities availed them in life. A person who could have done well as a medical doctor may not get the opportunity to be in a medical school but his

person may feel reasonable comfortable in another field of study. Persons with visual impairment may find themselves having feelings of not having quiet achieved what they had hoped to achieve due to lack of some important opportunities or materials in their lives.

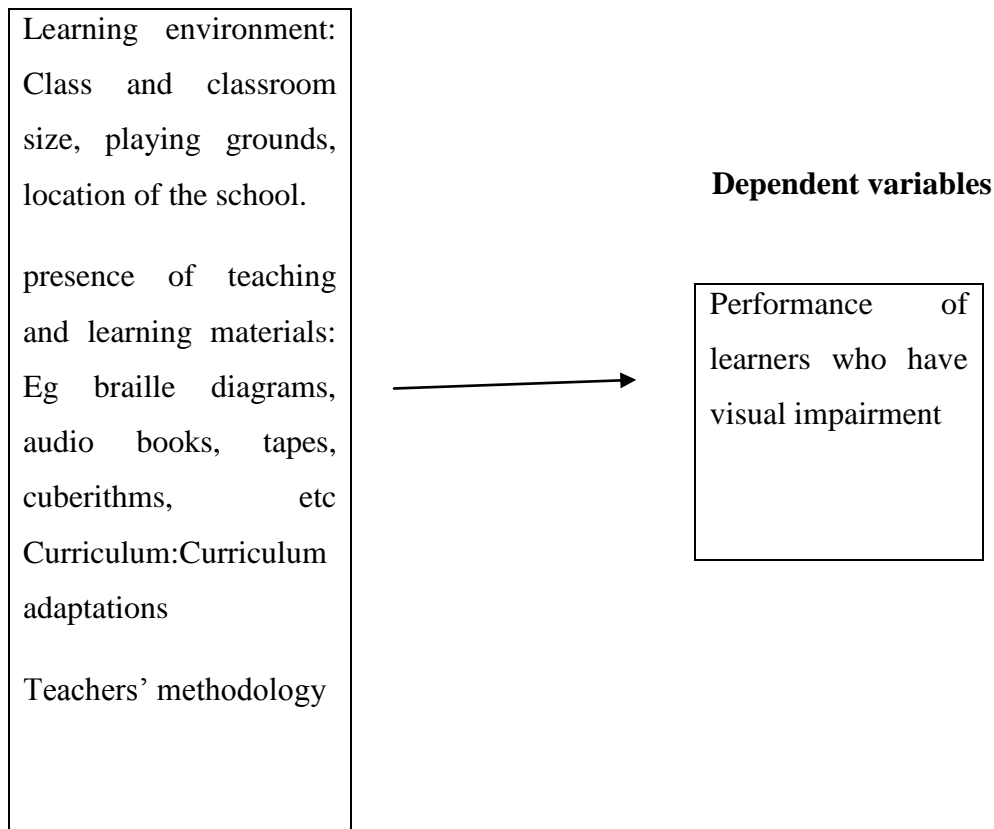
Maslow's hierarchy of needs theory is important to education of students who have disabilities mainly those who have visual impairment where all human needs must be meet in order to satisfy the students 'needs. Basic need to survive must be satisfied; their security must be secured where the school environment should be conducive to them to avoid anything which may disturb their free movement, their playing of different games and many other barriers which may frustrate their ability to perform well in school activities. Teachers, parents, colleagues and other educational stakeholders should give love and care to students who have visual impairment

They should be given time in order to express themselves and even their ideas. This will help them to know that they are very important and capable, recognize their value and rights. Hence performance and success will increase especially in subject which seem to be difficult for them including Mathematics. Learners who have visual impairment must be helped to maximize the use of their talents to the greatest extent where they are able to help their colleague whether with any kind of impairment or not.

## 2.4 Conceptual framework

The researcher developed a conceptual framework as an image that guides this work. In the work, the independent variable was factors influencing the performance while dependent variable was learners who have visual impairments' performance

### **Independent variables**



The performance of students who have visual impairment in Mathematics depends on the above variables, however it is not always the case that these variables are satisfied. When they are not satisfied, performance will drop.

This second chapter talked about literature review, empirical review, theoretical and conceptual framework. The literature review investigated the ideas of other researchers relating to the factors affecting the academic standard of students who have visual impairment in Mathematics. The researcher recognizes the fact that almost all literature reviewed was done in other countries not Rwanda, this could be put down in the fact that teaching of learners who have visual impairment is relatively recent in the country. However

findings from the reviews show that barriers recognized in those studies hold true to the performance of learners who have visual impairment. It discussed the theoretical framework where the researcher used theories of theorists in relation with the topic. Also the conceptual framework was discussed where the researcher expressed her point of view based on empirical literature review and variables

## **CHAPTER THREE: METHODOLOGY**

### **3.1 Introduction**

This section discussed the approaches that were used to gather data, research design, study setting, population, sampling strategies and sample size, research instrument, data collection techniques, data analysis, position of researcher, validity and reliability and ethical issues.

It began by examining the research design utilized in this work, namely qualitative and quantitative research and it offered explanations why they were selected to be used. The process of data collection was explained, instruments that were used and how they were used. As it was explained in Chapter 1, the research questions were selected for getting more information about the factors affecting academic performance of learners who have visual impairment in Mathematics. This chapter contained the tools which helped the researcher to get the answers to the research questions. The researcher utilized qualitative and quantitative research in order to get sufficient information.

### **3.2 Research design**

A research design is the plan that is used to collect and analyze data of this work. It shows the framework to be used, the kind of information required, its sources and approaches to be used Churchill & Iacobacci (2005).

The researcher used both qualitative and quantitative methods in this work.

The research was done through the use of the descriptive research design by using questionnaires and interviews. A descriptive survey design is an approach used to collect information by using interviews and questionnaire to a sample people Orodho (2004).

### **3.3 Study setting**

The research was conducted in Rwanda which shares a border with Burundi in the South, Uganda in the North, Tanzania in the East and DRC in the West. The school where the research was conducted is HVP Gatagara Rwamagana from Eastern province, Rwamagana district, Kigabiro sector, Nyagasenyi cell. The school specializes teaching students who have visual impairment. It is located at 50 km East of Kigali which is capital city of Rwanda, on the main road from Kigali to Kayonza near Rwamagana Hospital about 1km to Rwamagana districtheadquarter

Other neighbouring schools are Saint Aloys Rwamagana, Groupe scolaire, saint Vincent de Paul and Ecole primaire Alouette.

### 3.4 Population

Target population is the entire collection of individuals that the researcher need to investigate, Mbwesa (2008)

The population of the study was O-level learners with visual impairment of HVP Gatagara Rwamagana, teachers, Deputy of Studies and head teacher to get sufficient information on the factors affecting the students' academic performance in the subject of Mathematics.

### 3.5 Sampling strategies and sample size

#### 3.5.1 Sampling strategies

The researcher utilised Stratified random sampling to select teachers according to the subjects they teach while students were classified according to their classes and then simple random sampling was applied to choose senior three students and Mathematics' teachers.

#### 3.5.2 Sample size

The size of the simple was 15 students, 8 girls and 7 boys. 11 of the students were partially sighted and 4 students had total loss of vision. There was also the head teacher, the Deputy of Studies and two Mathematics teachers. The full sample size was 19 persons.

**Below is a table of the target population and sample size**

Respondents	Population	Sample size
Head teacher	1	1
Deputy of Studies	1	1
Teachers	35	2
Students	173	15
Total	210	19

### 3.6 Research instruments

To get enough information, the researcher used questionnaires and interviews. Questionnaires were formulated for teachers and students while interviews were for head teacher and Deputy of Studies

#### 3.6.1 Questionnaires

“A questionnaire is a research instrument consisting of a set of questions intended to capture responses from respondents in a standardized manner” Anol Bhattacharjee (2012:).



Questionnaires consisted of two kinds of questions, there were closed and open ended questions

### **3.6.2. Interview**

“The interviewers asked structured questions and then prompted accordingly in order to obtain more complete data” Orodho (2009).

The interviews consisted of the same questions to all respondents, the respondents answered orally one by one and their answers were recorded in order to be analysed afterward.

### **3.7 Data collection technique**

Different methods were used to get sufficient data; questionnaires were given to the learners and teachers while interviews were for the head teacher and Deputy of Studies. The researcher guided and explained to the respondents why the research was being conducted before filling questionnaires or answering interview questions. Respondents were explained that the findings were to be used to help to improve the performance in Mathematics for students with vision impairment. The researcher also gave the respondents sufficient time to answer the questions and let them feel free. All students who were present submitted their questionnaires. As they were 15, all 15 questionnaires were filled and submitted. On the side of teachers all questionnaires were submitted. The respondents who were expected to attend interviews were present and gave information.

### **3.8 Data analysis procedures**

The researcher used the following five (5) steps to analyse the obtained data:

1. Organizing data
2. Giving a code to the data collected to avoid vagueness when interpreting
3. Reading the data to obtain the sense of the information
4. Developing how information was to be represented
5. Suggesting the interpretation of findings.

The researcher analysed data by putting together the answers coming from questionnaires and those from interviews. Those from questionnaires were given code to avoid ambiguity when interpreting. The researcher read carefully the answers given in order to find commonalities, the answers from questionnaires were then classified into tables for easy interpretation. The information from interviews was interpreted narratively.

### **3.9 Ethical issues**

The researcher was granted permission from the University of Rwanda College of Education (UR-CE) to carry out this research. At HVP Gatagara Rwamagana permission was asked from the principal of the school. Questionnaires and questions of interviews were given enough time to be prepared for revision and corrections in case of mistakes.

The researcher explained to the respondents that the aim of the work was to investigate the elements that could affect the academic standards of students with visual impairment in Mathematics. They were explained that participation is voluntarily and every one had the right to answer all the questions or to answer only questions of their choice. They were informed that the data collected were to be used only for the purpose of this study and not any other purpose. To preserve the confidentiality of each respondent name were not required.

### **3.10 Validity and reliability**

#### **3.10.1 Validity**

Validity of the research is the extent to which a test measures what it is supposed to measure Kothari, (2005). Proof reading of questionnaires and interviews was done for organizing the questions well. Simple language was used for clarity.

#### **3.10.2 Reliability**

An instrument is reliable when the same or similar results are observed at the re-test with similar subjects Orodho (2004). The research is said to be reliable when the same characteristic is measured in different people. Different instruments like questionnaires and interviews were used to ascertain that the given answers were correct. The researcher did the retest by giving questionnaires and interviews to students and teachers at Education Institute for Blind Children Kibeho.

In conclusion, the chapter helped to get the required information as it contained the methods and instruments which were important to reach the responses to the research questions in the work. Information was collected carefully in order to gain reliable data that would be used to assist education of students who have visual impairment in Mathematics.

## CHAPTER FOUR: PRESENTATION, ANALYSIS AND INTERPRETATION OF FINDINGS

### 4.1 Introduction

This section indicated the findings of the research on the factors affecting academic standards of learners who have visual impairment in Mathematics at Gatagara special institution for visually impaired students in Rwamagana district.

The findings were obtained based on the research questions written bellow:

1. What are the causes of low performance in Mathematics for learners with visual impairment?
2. Is there any part of students who have visual impairment in their own low performance in Mathematics? What could be their role?
3. What is the role of teachers in the poor performance of learners with visual impairment in Mathematics?

The goal of the work was to discover the factors affecting academic standards of learners who have visual impairment in Mathematics. As such, factors were regarded as everything which might be a barrier in the performance of those learners in Mathematics. These factors were investigated by using a series of 10 questions in a questionnaire in which respondents (students) were asked to choose “yes” or “no” and in some cases to explain their choice briefly. For teachers, there were eight questions in the questionnaire where it was a mixture of close ended questions like complete and choose yes or no. The head teacher and Deputy of Studies were given interviews of four open ended questions, the answers of each respondent were kept to judge the variances and similarities in the answers.

### 4.2 Background information

This section showed background information of teachers, Deputy of Studies and head teacher. It focused on gender, and working experience.

**Table 1:** Responsibilities and gender distribution of staff members

Responsibilities	Female	Male
Head teacher	0	1
Deputy of Studies	0	1
Mathematics teachers	0	2
Total	0	4

**Table 2:** Disaggregation of respondents (students) by gender and age

Gender	Age				Total
	Between 10-15	Between 16-20	Between 21-25	Between 26 and above	
Male		3	3	2	8
Female	1	4	2		7
Total	1	10	2	2	15

The students seem to be older because in the last decade many Rwandans did not know the importance of educating learners who have visual impairment and even learners do not be aware on their rights. There is gender equality as the number of boys is nearby number of girls.

**Table 3:** Disaggregation of respondents (students) by gender and period of admission in the school

Gender	Age				Total
	Between 2005-2007	Between 2008-2010	Between 2011-2013	Between 2014 and later	
Male	1	4	2	1	8
Female	1	6			7
Total	2	10	2	1	15

**Table 4:**Disaggregation of respondents (students) by degree of visual loss

Gender of respondents	Degree of vision		Total
	Low vision	Total loss	
Male	5	3	8
Female	6	1	7
Total	11	4	15

Some respondents have low vision while others have total loss but all of them studied in the same class

### 4.3 Findings of the research

The following tables focused on how respondents (students) responded to the questions relating with factors affecting academic standards of students who have visual impairment in Mathematics.

**Table 5:** Feelings of students during the lesson of Mathematics

Are you comfortable and free during the Mathematics lesson?	Frequencies	Percentage
Yes	2	13.3%
No, if not, explain	13	86.6%
Total	15	100%

Table 5 indicated how students felt in the Mathematics lesson, the findings showed that 2(13.3%) respondents said that they felt comfortable and not stressed when Mathematics lesson is delivered while 13(86.6%) respondents said that they did not feel free and relaxed in the Mathematics lesson. Many of respondents said that they experience many problems when learning Mathematics.

Those who said no gave many reasons which explain the barriers experienced when learning Mathematics. Respondents A, F, H and M said that in Mathematics there were many graphs and drawings which were not very easy for them to understand because of the shortage of actual drawings and all necessary tools for drawing braille. Respondents B and E said that Mathematics was very difficult for students with total loss of vision.

Respondent C said that Mathematics had equations which were very difficult to understand. Respondent D, O and G said that they lacked materials which could help them to understand Mathematics. Respondent I said that Mathematics had many shapes which were difficult for them to conceptualize. Respondent L said that new curriculum is not accessible for them to understand Mathematics.

Learners with visual impairment feel less inclined to put much effort into Mathematics. *AS shown in a research hosted by Texas School for the Blind and*

Visually Impaired (2006, pge2), the researcher seems to feel that blind and visually impaired students would require greater aptitudes “For a person who has no sight or very little useful sight, the study of mathematics is difficult. It requires considerably more effort on the part of the student who is visually disabled than does the study of fields which are more verbal in nature. Generally, in order to achieve at reasonably high levels in mathematics, students who are blind must possess greater aptitude for the subject than their sighted counterparts “It is true that a student with visual impairment will require to use much effort to understand Mathematics while the teacher will also need to apply greater innovativeness to help the blind students to understand the subject.

**Table 6.** Availability of supportive materials in the Mathematics lessons.

Are you given sufficient supportive materials which help you to perform well in Mathematics?	Frequencies	Percentage
Yes	0	0%
No	15	100%
Total	15	100%

The researcher attempted to find out if teaching aids in Mathematics are enough. Table 6 indicates that all students 15(100%) said that they were not given sufficient supportive materials which might help them to perform well in Mathematics.

The above findings are supported by *Mariella Tanti (2006 pge33) who quoted Corley (1989) who found it next to impossible for learners who have visual impairment to understand size and weight without using touch, a sighted student can easily estimate the weight of an object by looking at it. It would not be as easy for a person who has visual impairment to come to that same conclusion without physically touching the objects is not equally easy for the visually impaired to come to the same conclusion without using his remaining senses. This problem, similarly, applies to the concepts of length and height.*

**Table 7.** Other learning materials which are needed to improve performance in Mathematics

Are there other learning materials that are not provided which if they were available they could improve your performance in Mathematics?	Frequencies	Percentage
Yes, if it is yes, list them	12	80%
No	3	20%
Total	15	100%

Table 7 showed that 12(80%) respondents confirmed that there are material they lack which could help them to do well in Mathematics. On the other hand, 3(20%) students said that there are no other needed materials.

Respondents who said yes listed those materials which are very important for them if provided. These were: talking calculators, recorders, computers, drawing materials in braille, screen reading software, Braille geometric set, textbooks in braille.

The above results are supported by *Broom (2004)*, who spoke about the importance of teaching aids for learners with visual impairment “*the creative use of a variety of media for learning increases the probability that students would learn more, retain better what they learn and improve their performance on the skills that they are expected to develop*”.

**Table 8.** School environment

Is the school environment conducive for your free movement?	Frequencies	Percentage
Yes	9	60%
No	6	40%
Total	15	100%

Table 8 indicated how respondents perceived the school environment. 9(60%) respondents said that their environment is conducive for their movement, 6(40%) respondents said that the school environment was not conducive for their free movement.

Feeling lost or confused while on the way, walking to a place, tripping over object or stumbling down curbs and many other such incidence can make children with visual impairment feel very frustrated and unwelcomingly visible. According to Johnsen *“Adaptation of teaching and learning environment is at the core of successful inclusive education. If the environment in which learning occurs is not supportive to students with visual impairments, their learning will automatically be interrupted”*. (Johnsen, 2001).

**Table 9.** Opportunity of students to participate in the subject of Mathematics

Are you given adequate time to participate actively in Mathematics?	Frequencies	Percentage
Yes	8	53.3%
No, if not, what are you lacking?	7	46.6%
Total	15	100%

Table 9 indicated the participation of respondents in Mathematics, 8(53.3%) said that they were actively involved in Mathematics, 7(46.6%) said that they did not participate actively in Mathematics. Those who said that the time given for Mathematics is not enough, many of them talked about the problem of materials. Respondent A, I, J, M and O said that lack of teaching and learning resources consume time which was allocated for Mathematics. Respondent B talked about the problem of lacking materials and added that, teachers had low experience in teaching Mathematics to students who have visual impairment.

Here there is evidence on how active participation of learners is helpfully in teaching and learning process. *Many years ago, learning was reflected as a result of teaching. The tutors participated actively while students follow his/her instruction passively. But as we see from (Webster & Roe, 1998), “an effective teaching is more than merely transmission of information from teachers to students, but rather a complex interaction between the two parts”. This would mean “A paradigm shift to a more participative system teaching and learning where teacher and learner engage in active discussions allowing the teacher to understand the needs of each learner more clearly” Bowring- Carr & West-Burnham (1997)*



**Table 10.** Revision of Mathematics in private study

During your private study, do you cooperate with your colleagues to revise Mathematics?	Frequencies	Percentage
Yes	13	86.6%
No	2	13.3%
Total	15	100%

Table 10 showed how respondents revised Mathematics during self-study. 13(86.65%) respondents agreed that they cooperated with their colleagues to revise Mathematics, 2(13.3%) respondents said that they did not cooperate with others when revising Mathematics.

Every possible strategy should be used to catch and retain the interest of learners. Mitchell puts it in this way *“Cooperative learning is a good strategy of teaching students with visual impairment, particularly in the mixed ability groups. It is especially important in third world countries where classes are very large” Mitchell (2008).*

**Table 11.** Performance gauge in Mathematics for the last term

In the last term, did you get above 50% marks in Mathematics?	Frequencies	Percentage
Yes	4	26.6%
No	11	73.3%
Total	15	100%

Table 11 indicated how respondents performed Mathematics in the past term (first term).

4(26.6%) respondents said that they got above 50% marks in Mathematics while 11(73.3%) said that they did not get above 50% marks in Mathematics.

*As it is stated by Megan K. Pidgeon(2012, pges3-4) in his thesis “Students with Visual Impairments and Math: Impact of Practice on Achievement and Attitude” achievement in Mathematics among blind and severely visual impaired has been extraordinary low compared to student with sight , taking an example of 2014 academic year, where 19 students from HVP Gatagara in Rwanda sat the o’ level*

exam, where 19 all of them got the lowest grade (9), in the year 2016 the same school among 14 students who sat the o' level exam one student got 6<sup>th</sup> grade while the rest only managed 9<sup>th</sup>.

**Table 12.** Possibility of selecting Mathematics in upper level

During the selection of combination in upper level, did you select some which contained Mathematics?	Frequencies	Percentage
Yes	2	13.3%
No	13	86.6%
Total	15	100%

Table 12 indicated how respondents choose to follow Mathematics in upper level (senior 4). 2(13.3%) respondents said that they selected Mathematics while 13(86.6%) said that they would not select Mathematics.

One of the greatest huddles that persons with disabilities have to deal with in society is the mind set of those around them. One of these is the misconceived beliefs that learners with visual impairment cannot grasp or understand Mathematics. Here is what Maguvhe have to say about this *“many teachers find it difficult to help their learners with appropriate knowledge acquisition strategies for science and mathematical subjects. Through the attitudes of teachers, many schools for the blind and partially sighted learners have no conviction that their own learners are good enough to do well in the pure sciences”*.  
Maguvhe M(2015) pge2

**Table 13.** Perception on methods used in teaching Mathematics

Do you agree with teaching methods used by your teachers in Mathematics lesson?	Frequencies	Percentage
Yes	15	100%
No, if not what is missing?	0	0%
Total	15	100%

Table 13 indicated how respondents evaluated the methods used by their Mathematics' teachers. All 15(100%) respondents said that the methods used in teaching Mathematics are appropriate.

The above table was supported by *the principle of the scientific character of studying Mathematics through systematization and correctly structuring the information to be taught, as well as ensuring the continuous process of learning. This principle is based on the correctness and accuracy of the information given to the blind student supported by: school curriculum, textbooks, didactic means, use of abstract, formal mathematical language, and mathematical Braille code. Systematization and structuring the information must ensure the continuity of learning by making sure the information transmitted is logical and by integrating the students' knowledge in appropriate evolutive systems, The program of European Union .KA201-2015-012)*

**Table 14.** Encouragement of teachers towards the selection of Mathematics in upper level to the students

Were you encouraged by your teachers to follow Mathematics in upper level?	Frequencies	Percentage
Yes	1	6.6%
No	14	93.3%
Total	15	100%

Table 14 showed that 1(6.6%) respondent affirmed to have been encouraged by the teacher to select Mathematics in upper level (Senior 4), 14(93.3%) said that they were not encouraged by their teachers to select Mathematics in upper level.

*As it was said by Manguvhe in the journal of disability Published online 2015 Nov 4. "the main reason why blind and partially sighted learners are unable to participate in sciences and Mathematics in large numbers is more about the lack of appropriate access technologies and teachers' attitudes than about intellectual incapacity of blind and partially sighted learners themselves"*

### Findings from questionnaires distributed to the teachers

Basing on the experience that they had, one stayed there for 7 years while another had 1 year. None of them had disability, their higher degree is A<sub>0</sub> in Computer Science with Education another in Mathematics and Computer Science with Education.

**Table 15.** Availability of teaching materials

Are you given sufficient materials to teach Mathematics?	Frequencies	Percentage
Yes	0	0%
No, if not list those which could improve the way you teach Mathematics	2	100%
Total	2	100%

Table 15 indicated that all respondents said that they were not given sufficient materials to teach Mathematics. They listed some of the missing materials which may improve the way they teach that subject: Geometric materials like adapted compass, adapted protractors and rules.

The situation in Rwanda as observed by the researcher is such that teaching materials required by learners with visual impairment are not readily available. The above table was supported by the idea of Mariella *“Lack of resources led the teacher and the learner to automatically skip certain mathematical tasks stated in the syllabus such as measuring angles using a protractor, measuring of objects using a ruler and other similar tasks”* Mariella Tanti (2006, pge17).

**Table 16.** Improvisation practicability

In the absence of some materials needed when teaching Mathematics, do you use locally available materials?	Frequencies	Percentage
Yes	2	100%
No	0	0%
Total	2	100%

Table 16 showed that all respondents agreed that they used improvisation to make some materials from locally available materials

Teaching aids are indispensable when teaching students who have visual impairment who must rely on touch to understand size, shape, weight, texture and so on, this is applicable in Mathematics and other practical subjects.

As in the case of Nigeria, where inadequate capital makes it difficult *“to procure the real media and equipment. Like in many African countries classes are far too large and outweigh the supplies”*. Azzara, (2002)

*Improvisation is very important as it improves collaboration between teacher and students; innovation and creativity at the lesson level, allows time for more activities some of which may not be part of the plan.* Kjellfrid Mæland & Magne Espeland (2017).

**Table 17.** Performance by students in Mathematics

Do your students perform well in Mathematics?	Frequencies	Percentage
Yes	0	0%
No, if not, what do you consider to be the main causes for their low performance	2	100%
Total	2	100%

Table 17 indicated that all respondents said that their students did not perform well in Mathematics; one said that many units require visual demonstration and experiment which are very difficult to explain to those learners with visual impairment. The other gave an example by saying that, if I have 15 students, 4 or 5 tried, then others failed but in national exam all failed.

It was supported by the idea of Mariella who said that, *“visually disabled students can be good achievers in Mathematics if an emphasis on concrete experiences is given to be able to develop their skills “*. Lack of teaching aids such as pictures, drawings or relevant objects may make it too difficult for who have visual impairment to full conceptualize the subject matter. *This could be seen as the root cause of low representation of persons who have visual impairment in mathematical subject and in forms of employments involving mathematics .* Mariella Tanti (2006)

**Table 18.** The influence of teachers when students are selecting the combination to be followed in senior four

Do you encourage your senior three students to select combination that contain Mathematics in senior four?	Frequencies	Percentage
Yes	0	0%
No	2	100%
Total	2	100%

Table 18 indicated that all respondents said that they did not encourage their students to follow the combinations that contain Mathematics in senior 4.

Many tutors do not find it easy to help learners who have visual impairment to acquire sufficient knowledge in science and mathematics on an equal level with other students. As results of attitudes of teachers in schools for learners who have visual impairment, that these learners cannot do well in pure sciences and mathematics, the students who have visual impairment also loose trust in themselves and believe that they indeed capture these subjects. Yet it has been proved that the learners who have visual impairment as just as intelligent and able to capture and do well in all subjects including sciences and mathematics the same as others.

However, the fact remains that blind and partially sighted learners are endowed with the same cognitive capacity as typically sighted learners (Kumar, Ramasamy & Stefanich 2001).

The above findings were collected by using questionnaires where students and teachers gave answers according to the questions that they were given. The research was not guided by questionnaires only but also interview for some staff members.

The following are results from interview with head teachers and Deputy of Studies on the factors affecting the performance of students who have visual impairment in Mathematics. The answers coming from the interview showed how learners with visual impairment from HVP Gatagara Rwamagana perform Mathematics, let us take an example of one of the respondents who said that “Our students perform poorly in Mathematics because they have negative attitude toward that subject. Most of them said that due to their disability, they cannot perform well in Mathematics as it needs more practice which seems difficulty for them”.

There is no big difference between the answers given by respondents; they said that their students did not perform well in Mathematics because it needs more practice and concrete materials which are often expensive and difficult to find. To solve this problem of teaching and learning materials, they said that they purchase those which are available in the capacity of the school, and then they used improvisation to make those which are not available by using local materials. But still there were those which they said that they could not be found or made by improvisation, for example, the researcher found that the textbooks were imprint, the respondent explained that “the teachers only produce in Braille what they need to give to

learners in class". All respondents said that they recognize the fact that the subject of Mathematics poses a measure problem to learners who have visual impairment but they encouraged their students to put effort in the subject of Mathematics even though it is very difficult as most of them have negative attitude towards that subject.

Data analysis is crucial as it is the means of labelling and understanding these raw data, in order to get the meaning and pattern from it Bell (2005)

In conclusion, the research was conducted in HVPGatagara Rwamagana among senior three students, Mathematics' teachers, Deputy of Studies and head teacher. Our population seemed small as there are only 2 schools for students who have visual impairment in the whole country which are in various districts. The findings showed that students performed poorly in the subject of Mathematics. There were similarities in answers coming from questionnaires of students and teachers and interviews of Deputy of Studies and head teacher where respondents indicated many elements which hinder the good academic standards of students in the subject of Mathematics

## **CHAPTER FIVE: SUMMARY, CONCLUSION AND RECOMMENDATIONS**

### **5.1. Introduction**

The section gave the summary of the study, conclusion and recommendations.

### **5.2 Summary**

The thesis is made up of five sections including introduction, literature review, methodology, presentation, analysis and interpretation of findings and summary, conclusion and recommendations. section one spoke about the background of the study, statement of the problem, objectives of the study, research questions, significance of the study, scope and limitation of the study and definition of terms. section two presents the empirical literature review, theoretical framework and conceptual framework. Chapter three covers the methods which were used to collect data, research design, study setting, population, sampling strategies and sample size, research instrument, data collection approaches, data analysis, position of the researcher, validity and reliability and ethical issues.

Chapter four indicated how findings were presented and analyzed. section five indicates study summary, conclusions and recommendations.



After analyzing findings of the study, it showed that the performance of learners who have visual impairment is poor due to many factors such as insufficient teaching and learning aids, negative attitudes towards Mathematics both from students and teachers, inappropriate methods of teaching and learning.

### **5.3 Conclusion**

Factors influencing the poor Performance in Mathematics at Gatagara special institution for visually impaired in Rwamagana district, was the topic of interest in the work. The core objective was to find out reasons for poor performance of learners with visual impairment in the subject of Mathematics

.

The study objectives: to find out reasons for poor performance of learners with visual impairment in the subject of Mathematics, to determine the role played by students where their performance in Mathematics is concerned , to determine the part of teachers in the poor performance of students with visual impairments in mathematics, to demonstrate the role of the school environment in the performance of learners with visual impairment in Mathematics. Both qualitative and quantitative methodologies were used. Data was collected through administering questionnaire to students and teachers while interviews were used for Deputy of Studies and head teacher.

The main findings indicated that students who have visual impairment perform very poorly in Mathematics due to many factors.

Teaching and learning resources including textbooks and appropriate mathematical learning materials, negative attitude towards Mathematics on both side teachers and students and teaching methods especial in Geometry which are not friendly to students who have visual impairment.

The study also showed that the school authorities and teachers have to find their own ways to teach Mathematics to the students who have visual impairment. This inadvertently made it difficult for them because they themselves are not familiar with the required materials. The general feeling among the students was that they only study Mathematics because it is a compulsory subject. They did not believe that Mathematics will be useful to them, nor can they excel in it; hence the negative attitude.

There is need to provide the special schools for visually impaired learners and other schools where there are learners with visual impairment with all the necessary materials and equipment including textbooks in accessible formats. Teachers must be given the necessary training to improve their methodology when teaching students who have visual impairment. Methods need to be improvised to get the students with visual impairment interested in Mathematics and to make them more participative in the subject.

#### **5.4 Recommendations and suggestions**

##### **To the Ministry of Education**

###### **The researcher recommended the Ministry of Education:**

To have a specific budget targeting education for students who have special needs;  
To develop in service trainings programs and provide relevant training for teachers on how Mathematics should be taught to students with visual impairment;  
Educational programs should be adapted to provide the needs of students who have visual disabilities.

##### **To Rwanda Education Board (REB)**

To provide teaching aids and materials to schools especially where students who have  
Special needs  
To strengthen education of students with visual impairment by developing and adopting a specific syllabus for inclusive education to enhance their academic standards in Mathematics;  
To develop a follow up scheme for district and sector education officers to safeguard that education for children who have special requirements including those with visual impairment is up to standard

##### **To the teachers**

- To use improvisation where there is scarcity of teaching aids in Mathematics
- Working as a team for learning from each other on how they may enhance the academic standards of who have visual impairment in Mathematics
- Claiming their rights when it is necessary such as need for trainings, and any other support from administrators
- Providing the needed support for students who have visual disabilities as it is their rights

### **For future studies**

- Constant updating of skills through in service training in keeping with new developments
- More in depth research aimed at improve academic performance of learners who have visual impairment.

### **5.5 Strengths and limitations of the study**

#### **Strengths**

- The sample population were positive and very motivated;
- Information was freely given as respondents felt that the study was needed

#### **Limitations**

- Sample was small due to limited resources
- Data were collected in only one school because trying to collect data from more than one school would have required much more time and long distance to travel

### **5.6 Conclusion**

This last section provides the summary of the study, conclusion of thesis, recommendations and conclusion of the chapter. The summary gives brief information to the whole thesis.

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# **APPENDICES**

## 1.Questionnaire for the students

### Background information

Complete this questionnaire by answering all questions. Do not worry about the information that you will give, they will be used for investigation on the factors that influencing the performance of visual impaired students in the subject of Mathematics

Section A: Background figures (complete or tick where it is necessary)

1. School location.....district.....sector.....cell.

2. Gender: Male  Female

3. Give your age:.....years

4. Write the year you started in this school.....

5. The following are types of disabilities, tick according to your special needs

Low vision  Total loss vision

### Section B: Questions

1. Do you feel free during the lesson of Mathematics?

Yes or No, if the answer is no, explain

2. Are you given sufficient supportive materials which help you to perform well Mathematics?

Yes or No

3. Are there other learning materials that are not provided and if are available they can improve your performance in Mathematics?

Yes or No If it is yes, list them

4. Is it School environment conducive for your own free movement?

Yes or No

5. Do you given enough time to participate actively in the lesson of Mathematics

Yes or No if the answer is no, what do you want?

6. In your self-study, do you cooperate with your colleague to revise the lesson of Mathematics?

Yes or No

7. In the last semester, did you get above 50% marks in the subject of Mathematics?

Yes or No

8. During the selection of combination in upper level, did you select some which contain Mathematics subject?

Yes or No

9. Do you agree with the methods used by your teacher in the lessons of Mathematics?

Yes or No if the answer is No, what do you want as any improvement

10. Did you encouraged by your teachers to follow Mathematics subject in upper level?

Yes or No



### **3. Interview guide for head teacher and deputy of studies**

1. Do you follow how your students perform in different subjects? How your students perform Mathematics subject?
2. If you find that a given subject is seem difficult to the students, what can you do?
3. What can you do when Mathematics'teachers ask to be given teaching materials that are not available in the school?
4. Do you encourage your students to put an effort in learning Mathematics subject?

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