# Continuous Professional Development for In-service Teacher on Vision Assessment and Education Module

**Tanzania Institute of Education**

**2023**

Published 2023

ISBN: 978-9987-09-702-9

Tanzania Institute of Education,
P. O. Box 35094,
Dar es Salaam.

Telephone: +255 735 041 168
+255 735 041 170
E-mail: director.general@tie.go.tz
Website: www.tie.go.tz

This module shall be cited as: Tanzania Institute of Education (2023). Continuous Professional Development for In-Service Teacher on Vision Assessment and Education Module. Dar es Salaam: Ministry of Education, Science and Technology.

# Table of Contents

# Acknowledgements

The Tanzania Institute of Education (TIE) recognises and values the important contributions of all organisations and individuals who participated in the design and development of this module.

**Writers:** Dr Fika Mwakabungu, Ms Edna Mathew (TIE), Mr. Emmanuel Stanilaus (TIE), Mr. Marcus Kipangule (TIE), Mr. Castor Lyuma (TIE), Ms Merina Yohana (TIE), Ms Alida Kauki (PATANDI TC), Mr. Mohamed Mgeni (PATANDI TC), John Urio (PATANDI TC) & Ms Happines Eliab (PATANDI TC).

**Editors:** Pro. Gunvor Berkeland Wilhelmsen (Western Norway University of Applied Sciences), Prof. Marior Felder (Koblenz University of Applied Sciences)

**Designer:** Peter M. Mbute (TIE)
**Illustrator:** Fikiri Msimbe (TIE)
**Coordinator:** Ms Edna Mathew & Mr Marcus Kipangule
**Supervisor:** Dr Fika B. Mwakabungu

In addition, the Institute expresses its sincere gratitude to all teachers who participated in the trial of this module. The Institute also extends its gratitude to the Western Norway University of Applied Sciences (HVL) for its support through the project of Learning is Visual (LiV), *TAN-21/0005, NORHED II.*

Dr. Aneth A. Komba
Director General
**Tanzania Institute of Education**

# Abbreviations and Acronyms

| | |
|---|---|
| ADD | Attention Deficit Disorder |
| ADHD | Attention Deficit Hyperactivity Disorder |
| CPD | Continuous Professional Development |
| ESR | Education for Self-Reliance |
| ICT | Information and Communications Technology |
| IEP | Individualised Education Programme |
| LiV | Learning is Visual |
| LV | Low Vision |
| LVD | Learner with a Vision Disturbance |
| MoEST | Ministry of Education, Science and Technology |
| NA | Needs Assessment |
| PO-RALG | President's Office Regional Administration and Local Government |
| TIE | Tanzania Institute of Education |
| TRC | Teacher's Resource Centre |
| VA | Visual Acuity |
| VD | Visual Disturbance |
| VI | Visual Impairment |
| WHO | World Health Organisation |

# Preface

## Background information

Tanzania Institute of Education (TIE) is a public institution under the Ministry of Education, Science and Technology (MoEST) established by Act of Parliament No. 13 of 1975. The Institute is charged with the responsibility for interpreting government policies on education to benefit curriculum programmes and instructional materials in order to facilitate the provision of quality education at pre-primary, primary, secondary and teacher education levels. The Act also gives TIE the mandate to design and develop curriculum materials, provide technical advice and offer orientation training concerning the implementation of curricula at pre-primary, primary, secondary and teacher education levels. Continuous professional development is important to teachers in implementing curricula. Teachers should be provided with orientation trainings, since they are the main curriculum implementers.

In 2015, through TIE, MoEST reviewed the Standard I - II curriculum. The curriculum is geared towards developing literacy and numeracy skills. In 2016, Standard I–II teachers were trained on how to implement a competency-based curriculum. In 2016, the Standard III–VI curriculum was also reviewed to make it a competence-based curriculum. For effective implementation of the competence-based curriculum, TIE provided training to Standard III - IV teachers. Furthermore, in 2019, the Standard VII curriculum was reviewed to make it a competence-based curriculum as well. These changes affected the ways of teaching and learning in the school setting. In this context, learning and teaching activities demanded more the vision of learners.

At present, there is no college or educational institute offering to in-service teachers a course on screening, identification, assessment and intervention in vision disturbances among learners to improve learning. The pedagogy for vision assessment and education focuses on helping learners to use their vision to effectively interact with the teaching and learning environment and

situations so as to attain an academic achievement. In the competence-based curriculum, learning is visual as it involves learning and teaching activities which need the learner to see and interact with learning materials to promote knowledge, skills, values and attitude/behaviour.

In schools, learning and teaching is about how to teach learners through vision based activities in a classroom situation. Through continuous professional development, you will improve your teaching skills by being well be equipped with strategies and techniques for screening, identifying, assessing and intervening with respect to learners with vision disturbances in an educational setting. This module is therefore, prepared to equip you with the skills required in teaching learners with vision disturbances.

## Needs assessment

In 2020, TIE conducted a needs assessment on the implementation of the competence-based curriculum. The assessment involved teachers from different regions of Mainland Tanzania. The assessment revealed that the implementation of the curriculum was not good owing to various challenges. Some of the challenges are a limited understanding of the concept of competence - based curriculum among teachers, syllabus analysis, preparation of competence-based lessons to develop pupils' competencies and the use of different techniques in doing formative assessments and providing feedback. Other challenges are lack of teaching and learning facilities/materials to enhance learning, overcrowded classrooms, dilapidated infrastructure and a limited understanding of the teaching methods that help to meet the needs of a class with many pupils and pupils with special needs.

Moreover, in 2021, in collaboration with Patandi Teachers' College of Special Education, TIE conducted a needs assessment on vision assessment and education in schools. The assessment sought to find out teachers' ability to screen, identify, assess and intervene vision challenges among of learners. The reports on the two assessments suggested the following recommendations

in order to improve the learning and teaching of learners in schools: First, it was recommended that continuous professional development modules for in service teachers should be prepared so that teachers could help pupils learn by developing the ability to use their vision in different situations. Secondly, it was recommended that in-service teachers should be given orientation training so that they could solve the teaching and learning challenges discovered during the needs assessment. Finally, it was recommended that school infrastructure and the available instructional materials should be improved. On the basis of the results of the two needs assessments, TIE has prepared the **Continuous Professional Development module for In-Service Teachers on *Vision Assessment and Education***.

# Introduction

## The philosophy of Education for Self-Reliance

The development of this module is based on Tanzania's philosophy of Education for Self-Reliance (ESR), which emphasises the provision of education that is in tune with the needs of the society. This philosophy places emphasis on fostering communication, critical thinking and inquiry learning, collaborative learning, education and work, school and community partnerships, development of literacy and numeracy skills, and the development of science and technology. The philosophy is also geared towards building a nation of educated and motivated people capable of growing the economy, meeting the needs of the labour market and sustaining competition. ESR also emphasises teaching and learning that is tailored to the needs of the learners; thus, it develops the skills identified as essential to those graduating at various levels of education in the 21st century.

### Aim of the module

The aim of this module is to impart research-based knowledge, skills, values and attitudes to in-service teachers to support learners with vision disturbances. Specifically, the module is intended to improve teacher's competence in:

(a) Using various methods, strategies and tools to ASSESS and INTERVEN learners with vision disturbances; and

(b) cooperating with health experts to identify leaners who need health support.

### The target group

This module is designed to be used by in-service teachers. The purpose is to enable them to develop the required competencies set out in the curricula and syllabi for pre-primary, primary and secondary education.

## How to use the module

This module is specifically designed for facilitating learning in the course of study of vision assessment and education. You need to read the module carefully, do all the activities and answer all the questions assigned to you. While doing activities, you are encouraged to consider to use 5Es for deep learning and develop critical thinking, creativity, collaboration and communication. The 5Es stand for:

***Engage*** = connect past and present

***Explore*** = work in groups to gain common understanding on concepts and related contexts

***Explain*** = describe, broadly and deeply, your own understanding of concepts linked to real life situation

***Elaborate*** = apply and extend the concepts and skills in new and related situations

***Evaluate*** = conduct self-assessment of your total experience of the given lesson

Additionally, you must make use of Community of Learning (CoL) at your school. It will be beneficial to discuss any challenges with your colleagues and develop solutions. CoL is anticipated to improve strategies for assisting learners with vision disturbances. Moreover, using this module could boost your expertise and confidence in recognizing and assessing learners with vision disturbances, leading vision stimulation intervention courses, and enhancing classroom viewing circumstances to ensure the learner receives a quality education

## Structure of the module

This module is divided into two sections. The first section contains the preliminary pages. You are supposed to read this section to get insight into how to study the module. The second section focuses on the content of the module. The section has eight units. Unit One: Theoretical aspects of vision for reading and learning; Unit Two: Vision development; Unit Three: Screening and assessment of vision; Unit Four: Vision in reading; Unit

Five: Brain plasticity and vision; Unit Six: Vision stimulation; Unit Seven: Measures for preventing vision disturbances; and Unit Eight: Communicating vision disturbances to society. There are various activities you have to do and questions you have to answer in each unit. In addition, after doing all the activities and answering all the questions in each unit, you need to reflect on each unit by answering the questions and relating the knowledge you gained to your teaching.

## Teaching and learning materials/aids/tools

The recomended teaching and learning materials/aids/tools can be used with other improvised aids based on your environment. The latter should relate to the competence you expect to develop in the learners with vision disturbances. You are advised to be creative and flexible so as to use teaching and learning aids and tools according to their importance and availability in your environment.

## Teaching and learning activities

The in-service teacher is required to study all the units in the module. The programme will be offered at Patandi Teachers' College of Special Needs Education. The knowledge and skills to be developed will enable you to improve the teaching and learning process among the learners with vision disturbances. In developing the intended competencies, different activities will be done. There will be lectures, workshops, field works as well as school-based practical activities. Apart from that, you will conduct practical functional vision-related assessments as well as practical vision lessons for stimulation purposes and deploy learning methods appropriate to the individuals on campus and in schools. In addition, you will be required to study theories related to vision assessment and education, and present your findings.

## Mode of training

The duration for this CPD programme is one year, which is divided into two terms. The module consists of eight units. The units will be covered in the

following way: Units One to Four will be covered in the first term and Units Five to Eight will be covered in the second term. In each term, there will be theoretical and practical works on campus. While outside the campus, you will do take home assignments. Thus, you will have to visit Teachers' Resource Centres (TRCs)/Assessment Centres to share your experiences, achievements and the challenges you faced while studying at the college.

In collaboration with TIE, Patandi Teachers' College of Special Needs Education will make a follow-up on the progress of the course. Before you start carrying out the activities in each unit, you need to answer the relevant questions to assess your knowledge. After doing the activities, you need to answer the relevant questions to determine your achievement.

## Programme assessment

Assessment will be done to find out if the intended competencies have been developed as expected. The assessment will comprise the following: individual assignments, group assignments, fieldwork or workshop presentations and student portfolios. At the end of each term, you will do an open examination. Monitoring of the teaching and learning process will be done inside and outside classroom throughout the programme. The assessment of the programme will be conducted by the facilitators under the supervision of Patandi Teachers' College of Special Needs Education to make sure that the programme has an intended quality outcome.

The assessment will involve all the units and you are required to get atleast grade C to qualify to be awarded a certificate of attendance to the in-service training in vision assessment and education. Assessment of the programme will be done in each term. The assessment criteria for each term are listed in Tables 1, 2 and 3.

**Table 1: Term one assessment criteria**

| Assessment type | Individual assignment | Group assignment | Fieldwork or workshop | Student's portfolio | Open examination | Total |
|---|---|---|---|---|---|---|
| Awarded marks | 15% | 15% | 25% | 5% | 40% | 100% |

**Table 2: Term two assessment criteria**

| Assessment type | Individual assignment | Group assignment | Fieldwork or workshop | Student's portfolio | Open examination | Total |
|---|---|---|---|---|---|---|
| **Awarded marks** | 15% | 15% | 25% | 5% | 40% | 100% |

**Table no. 3: Performance standards**

| Score | Grade | Interpretation |
|---|---|---|
| 75 - 100 | A | Excellent |
| 64 - 74 | B | Very good |
| 44 - 63 | C | Good |
| 34 - 43 | D | Satisfactory |
| 0 - 33 | F | Unsatisfactory |

## Monitoring and evaluation of the programme

As the programme will be offered at Patandi Teachers' College of Special Needs Education in collaboration with the college's administration, tutors will be the main implementers and supervisors of the programme. TIE will be responsible for monitoring, evaluation and certification at national level. Evaluation of the implementation of the programme will be done after completion of the programme. The objective of the evaluation is to find out if the programme has been implemented as planned and to identify the challenges that arose during the implementation for improvement of the

programme. The evaluation will involve different educational stakeholders at the school, college and national levels. Evaluation tools will be prepared by TIE in collaboration with Patandi Teachers' College of Special Needs Education. The preparation of the tools will involve different educational stakeholders.

# Symbols and their interpretations

The following symbols have been used to simplify your interaction with different sections in a given unit:

| Symbol | Interpretation |
|---|---|
|  | Specific competencies |
|  | Personal development plan |
|  | Tools or practical resources to enhance teaching and learning |
|  | Teaching and learning activities to be done |
|  | Log for reflection |
|  | Assessment activities |
|  | Self-assessment |

Summary

Reflection

References

# Unit One

## Theoretical aspects of vision for reading and learning

### 1.1 Introduction

Reading is an essential activity in education and a critical factor in the teaching and learning process. It is also one of the most important and basic skills learnt in school. Since reading starts as a vision process, vision is essential in the learning process at all levels. In this unit, you will learn about the concept of vision for reading and learning, the structure of the human eye and the mechanism of vision. The knowledge to be gained will enable you to take appropriate steps to deal with vision disturbances in reading and learning in your school and community.

In this unit, you are expected to develop the following competencies:

(a) Explaining the concept of vision for reading and learning
(b) Describing the structure of the human eye
(c) Describing the function of the parts of the human eye
(d) Explaining the mechanism of vision

**Time: 20 Minutes**

Imagine that you are teaching a certain class and you have found that one of your learners is tilting his/her head when reading a textbook. How would you help such a learner?

1. How was the task?
2. How did this task help you to understand the theoretical aspects of vision for reading and learning?
3. If you were given another chance, how differently would you do the task?

## 1.2 The concept of vision

Vision is defined as the ability to see with respect to a particular position. It is a dynamic process that is far more complex than just being able to see clearly when you are looking at a stationary object such as a symbol on an eye chart. It also involves looking at multiple stimuli in different colours, shapes and sizes that are constantly changing in time and space, and being able to work out the meaning of these stimuli.

Our vision is an important sense, since it allows us to understand our surroundings, connects us with others and helps us manage many activities. In the modern world, it is more important than ever to have a good vision. To be able to manage the tasks given at school and in our families and communities, we need to observe forms and details and understand colours, shapes and patterns. From birth to death, a person learns to calculate distance, understand shapes and learns how objects are placed in relation to each other and do many other visual calculations. This is learnt through trial and error.

Vision also comprises elements which are very functional when it comes to the mechanism of vision. The elements include visual acuity, which is about the ability to see small details, contrust vision, which is concerned with eyes being able to perceive small differences in brightness, and field vision, which refers to the capacity of eyes to respond to stimuli outside the area of central vision.

There are several qualities of vision. With respect to the quality of clear vision, it is a good idea to have emmetropia. This occurs when both eyes are directed

onto a distant object and the light falls directly on the fovea, the central part of the retina in both eyes. Thus, the brain gets the same clear image from each eye with no refractive error or de-focus. This means that one gets the ideal vision on distance. The vision is clear and focused.

(a) When someone is *near-sighted (myopia)*, he or she sees nearby objects clearly but objects which are far away look foggy. Here, the eye lens bends the light so much that it cannot reach the *fovea*. The problem might be solved with a minus lens in glasses or the eyes can learn to relax.

(b) Those who are *far-sighted (hypermetropia)* can see distant objects more clearly than nearby ones. Here, the lens bends the light low enough for a clear image to appear on the *fovea* when one is looking at nearby objects. This results in reading problems because near inputs are unclear. Plus lenses are used to enlarge images, but for some, the accommodation can be strengthened.

(c) Astigmatism is the imperfection of the curves of the cornea or lens. The light passes to the retina in different lengths and makes it difficult for an individual to see clearly. The light from one direction can be bent more than the light from another direction. It might be corrected with special glasses.

(d) Presbyopia occurs when people are between 40 and 50 years of age. Such people start struggling with reading because letters are unclear and they might need reading glasses. The theory is that the power of eye muscles becomes weaker and the eye lenses become harder.

1. What is my current understanding of vision for reading and learning?
2. What more do I need to know about the concept of vision for reading and learning?
3. What strategies should I use to understand the concept of vision for reading and learning?

Subject syllabi, books, flip charts, marker pen and observation checklists

**Time: 60 Minutes**

Understanding the concept of vision for reading and learning

**Steps**

Visit a nearby school or class and

1. Select one class and draw small and large pictures on the board.
2. Ask the learners to name the pictures (point from small to large pictures).
3. Observe the learners' eye movement and condition during this process.
4. Record the reactions of the learners' eyes during the process.
5. Discuss with the class teacher the indicators of vision disturbances among the learners.
6. Write a report on what has been discussed and keep it in a portfolio.

1. How was the task?
2. How did it help you to understand the concept of vision for reading and learning?
3. If you were given another chance, how differently would you do the task?

1. Explain how you could identify learners with vision disturbances in reading and learning.
2. Do you think that any vision challenges cause visual impairment?

1. How effective was the learning?
2. What was not understood in relation to the concept of vision for reading and learning?
3. What do I need to understand more about the concept of vision for reading and learning?

Some people have very good vision and can see clearly tiny details which are far away and near. Others have a very good visual attention for everything that is presented in their surroundings either moving-objects or something with a special shape. However, in every class, there are learners with reduced or disturbed vision. The most dramatic reduction of vision results in blindness, but there are many levels of reduced vision between perfect vision and blindness. If learners have any kind of vision reduction or if some vision qualities are disturbed, they might not be able to perform certain tasks at school.

As a teacher, you are expected to determine if a child has a vision challenge. In an educational setting, we say that all learners who are struggling due to reductions of any vision qualities have a vision disturbance. In the health system, visual impairment is a term mostly used to refer to reduced visual acuity (VA), or the detail vision, is on a level of low vision (LV) or blindness due to the definitions from the World Health Organisation in the classification system ICD-11, (see Table 4). These VA reductions are often caused by eye diseases, accidents, neurological illnesses or other eye conditions. The VA cannot improve to a normal VA level through refraction or other form of correction.

**Table 4:** Level of vision impairment (VI) related to visual acuity (VA) for distance, after ICD-11

| Level of VI | Visual acuity scale | | |
|---|---|---|---|
| | 6m | 20ft | Decimal |
| **Mild** | <6/12 but ≥6/18 | <20/40 but ≥20/70 | <0.5 but ≥0.3 |
| **Moderate** | <6/18 but ≥6/60 | <20/70 but ≥20/200 | <0.3 but ≥0.1 |
| **Severe** | <6/60 but ≥3/60 | <20/200 but ≥20/400 | <0.1 but ≥0.05 |
| **Blindness** | <3/60 | <20/400 | <0.05 |

In ICD-11 WHO also focuses on the VA level for near sighted activities. This means that it is necessary to use the VA tests developed for 40 cm. A reduction under 6/12 (20/40 or 0.5) at near-sighted activities is also classified as low vision, even if the distance VA is normal. Some have vision challenges even if the VA is better than mild VI (6/12, 20/40 or 0.5) and even perfect. A VA of 0.6 and other disturbed visual might cause a headache by near sighted activities, double letters by reading, concentration problems or challenges discovering vision objects in the surroundings. In an educational setting, we talk about *vision disturbances* (VD), which include smaller VA reductions, eye muscle problems or challenges with vision attention. You must be aware of the educational difficulties that learners have in relation to these types of vision disturbances. In schools, it is necessary to effectively deal with vision disturbances by improving the learning environment and learning methods.

WHO does not use the term vision disturbances, but it recognises many other vision functions which might be impaired (see Table 5). Some might have a vision capacity which fluctuates and results in fatigue, a headache and glare. These problems can occur during the day. Vision disturbances (VDs) may be caused by eye-muscle imbalances which produce confusing visual inputs.

**Table 5**: List and descriptions on other vision impairments presented in ICD-11.

| Codes of Vision impairment | WHO's descriptions |
|---|---|
| *9D40 Impairment of visual acuity* | Visual acuity refers to the ability to recognise details at the point of fixation, which usually is the fovea. It is expressed as an angular measure, usually measured as distance and/or near acuity. |
| *9D46 Impairment of binocular functions* | Double vision<br>Suppression of binocular vision<br>Certain specified disorders of binocular vision |
| *9D45 Impairment of light sensitivity* | Light sensitivity is also known as photophobia, in which bright light disturbs one's vision |
| *9D44 Impairment of colour vision* | Colour vision refers to the ability to distinguish colour differences. True colour "blindness" is extremely rare. Most colour vision deficiencies are minor and congenital, with X-linked recessive inheritance (more prevalent among men). Some drugs and optic neuritis may also cause colour vision deficiencies. |
| *9D43 Impairment of contrast vision* | The ability to distinguish small differences in brightness between adjacent surfaces |

| Codes of Vision impairment | WHO's descriptions |
|---|---|
| *9D42 Patterns of visual field impairment* | Ranges of visual field impairment refer to the extent of peripheral vision outside fixation. The extent should be measured for each eye separately. |
| *9D41 Impairment of visual field* | XK9J Bilateral<br>XK8G Left<br>XK9K Right<br>XK70 Unilateral unspecified |
| *9D7Y Other specified impaired visual functions* | Refers to other eye conditions which affect an individual, for example slow vision (bradyopsia) |
| *9D7Z unspecified impaired visual functions* | Refers to other vision problems which are unidentified |

*Amblyopia* (a lazy eye) is a reduction of the visual acuity on one eye. This is often the result of *strabismus*, muscle imbalance. In strabismus, eyes do not work perfectly together and the brain gets double images, one image from each eye. Through experiences, the brain learns that one image is more credible than the other. The inputs from the credible eye will get the attention and those from the other eye will be suppressed and the VA will be reduced. The *stereo vision* is restricted because it builds on two matching images. Reduced stereo vision negatively influences eye-hand coordination and the ability to calculate distance. Learners with *strabismus* and other binocular problems might struggle with concentration, get a headache or feel dizzy.

Some learners might struggle under *the light conditions*. Too much light reduces the quality of visual inputs. It is difficult for one to read the writings on the blackboard and even the text in a book. A visual acuity that is lower than 6/12 (20/40 and 0.5) near or at a distance is categorised as LV, but there is no categorisation of the VA that is better than 0.5 but under the normal 1.0.

Learners with reduced VA like these remain undetected or are classified as people with normal vision.

The VA, all eye movements and visual attention are closely connected. When elements in the surroundings are detected in the visual field, the brain activates the eye muscles to move the gaze to the spot of interest. Only objects which are precisely focused on will be seen with the very best VA through the cone-cells in the *fovea*. The connection of these vision elements is called *the vision circle,* while the eye motor capacities influence sensory and perceptual functions, and vice versa. Even tiny eye motor disturbances can affect concentration, attention, endurance, social communication, reading and writing, and motoric activities, and negatively influence learning. Good vision is therefore, important at all levels of education.

Reading is the most important factor in learning, so vision challenges must be uncovered and dealt with. Learners with disturbed vision must be screened and the functional vision evaluated. Vision qualities are stimulated through activities like sport and games, peer learning and subject clubs inside and outside the classroom. In the interest of those with specific challenges, individual adapted methods are needed. It is important to understand how different vision components are used in reading and where the child should sit in class. A vision teacher must understand how vision qualities are acting during the reading and learning process.

## 1.3 Structure of the human eye

The eye is the organ for vision and is dependent on light from the environment. The light is transformed into electric signals, which are forwarded to many different areas in the brain. It is with the brain that we see. The eye is roughly spherical in shape and located in the orbit in the skull. The orbit protects the eye against physical damage. Around the eye there is a wall with three layers. The *sclera* is the outer layer, which has the clear *cornea* in front. The middle layer is the *choroid* which has *ciliary muscles* for controlling the form of the

*lens* and *iris* with its adjustable *pupil*. The *retina* is the most inner layer with both the *fovea* (the spot for detailed vision) and the *blind spot,* where the *optic nerve* starts transporting visual signals to the brain.

1. What is my current understanding of the structure of the human eye?
2. What do I need to know more about the structure of the human eye?
3. How can I understand more about the structure of human eye?

Subject syllabi, books, flip charts, marker pens, eye models, eye pictures and eye drawings

**Time: 60**

Studying the structure of the human eye

1. In groups of three to five, use a model of the human eye to study the different parts of the eye. Your study should be guided by the following:
   (a) Parts of the eye
   (b) The position of each part
   (c) Their functions
2. Write a summary of your discussion and put it in your portfolio.

1. How was the task?
2. How did it help you to understand the structure of the human eye?
3. If you were given another chance, how differently would you do the task?

Explain the functions of each part of the human eye.

1. How effective was the learning?
2. What was not understood about the structure of the human eye?
3. What do I need to do to understand more about the structure of the human eye?

The human eye can be divided into three layers, namely the outer layer, the middle layer and the inner layer. The outer layer comprises with two parties namely *cornea* and *sclera*. *Cornea* is found in the front part of the eye and the *sclera*, is found in the entire eye which is whitish in colour. The middle layer comprises the *iris*, the *ciliary body* and the *choroid*, which all together form the uveal tract (the middle layer). The inner layer comprises the *retina*, which contains the cone and the rod cell found at the macular, where the *fovea centralis* is also located.

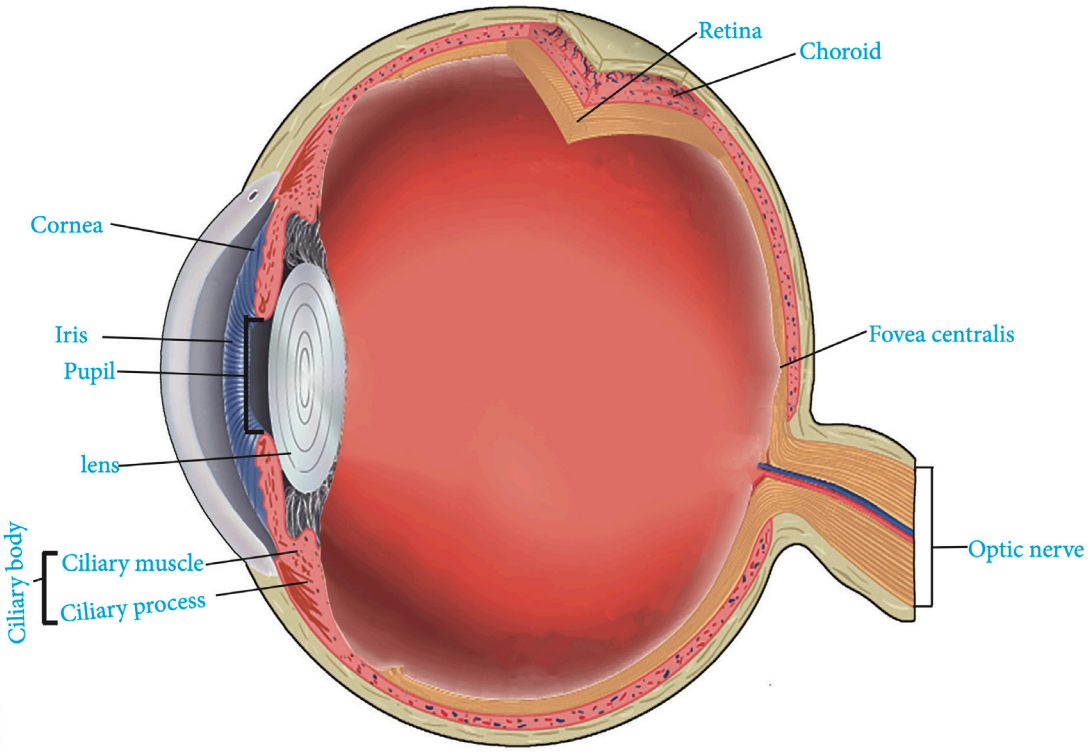


**Figure 1:** The human eye with different elements

**Parts of the human eye and their functions**

(a) The *cornea* (clear portion of the eye) is the front part of the sclera, which allows photons of light to pass into the eye.

(b) The *iris* is found under the cornea and has coloured muscles (blue, green, brown). The colours protect the eye from too much light.

(c) The *pupil* is an opening in the iris, which looks black because it is dark inside the eye. The *iris* expands and constricts the *pupil*, thus regulating the amount of light passing into the eye.

(d) The *lens* is placed behind the iris and positioned immediately behind the pupil and refracts light to the *retina*.

(e) The *retina* is the inner surface of the eyeball with a layer of photoreceptor cells (light sensitive cells). There are two different

*photoreceptors: cods* and *rods*.

(f) Rods work in groups and can therefore, forward signals even in twilight. They are useful for grasping information from a broader visual field. Cones are mostly located in the centre of the retina. They need much light to function well and are responsible for coloured and detailed information.

(g) The *fovea centralis* is the retina region directly opposite to the lens. It is the most sensitive part of the *retina* with a high density of *cones*. To see details, the eye must fixate on an object so that light falls on the *fovea*.

(h) The *blind spot* is the area in the retina where the *optic nerve* leaves the eyeball. There are no *rods* or *cones* in the *blind spot*, so no visual signals are detected there.

(i) The *ciliary body* is a ring-shaped tissue which holds and controls the movement of the eye lens.

(j) The *choroid* supplies blood to the eye. It also controls light so that it is not reflected from inside the eye.

(k) The *eye muscles*

i. The *ciliary muscles* keep the lens in place and change their shape when one is looking at something near or distant.

ii. The *iris sphincter muscle* is found in the coloured iris and constricts the amount of light passing through the pupil. It works together with the *dilator pupillae,* which is found in the outer part of the iris and expands the pupil when more light is needed.

iii. The outside eye muscles move the eyes in different positions: *Superior Rectus, Inferior Rectus, Lateral Rectus, Medial Rectus, Superior Oblique and Inferior Oblique.*

## 1.4 The mechanism of vision

Vision includes functions such as visual acuity, contrast sensitivity, colour recognition, depth view, motion perception and others. These aspects of vision work better under responsible light and how objects look.

The central part of the retina, the fovea, is placed in the middle of the macula region and is responsible for our visual acuity (VA). This is used to read, drive and look at pictures or faces. Good central vision allows a person to see shapes, colours and details clearly and sharply.

In order for someone to have effective vision, the vision components must be coordinated. As mentioned earlier, this involves paying intact attention in the visual field to recognise elements in the surroundings, quick eye movements, the gaze can move to the spot of interest and an active central field for inspection of interesting elements cf. the vision circle.

**Visual attention** is the awareness of objects and stimuli from the visual scenes and surroundings. The attention process involves the primary visual cortex and high-level centres, which participate in visual working memory and pattern recognition. Visual attention can be directed to selected locations in the visual field and plays an important role in reading.

**Ocular motor activities/eye movements** or *skills* refer to the ability to move our eyes in different directions and positions like:

**(a) Saccade**: The eyes make an accurate "jump" from one object to another.

(b) Fixation: The eyes are held steady on a spot without losing the target.

**(a) Smooth pursuits:** The eyes follow a moving target or object.

**(b) Accommodation:** Regulation of the refractive power of the lens for different viewing distances.

**(c) Convergence:** Moving the eyes towards the same near spot.

1. What is my current understanding of the mechanism of visual and vision functions?
2. What should I do to understand more about the mechanism of vision and vision functions?

Books, flip charts, marker pens, eye models, eye pictures and drawings

**Time: 120 Minutes**

Investigate the mechanism of seeing (use a camera as a model to explain how the human eye works).

**Steps**

1. Sit in groups of three or five.
2. Discuss how a camera works.
3. Compare how the camera works with the mechanism of the lens in the human eye.
4. Write a report on your discussion and keep it in a portfolio.

1. How was the task?
2. How did it help you to understand the mechanism of vision and vision functions?
3. If you were given another chance, how differently would you do the task?

Analyse the mechanism of vision and vision functions.

1. How effective was the learning?
2. What was not understood about the mechanism of vision and vision functions?
3. What do I need to do to learn more about mechanism of vision and vision functions?

The refraction of light in the eye is similar to the way a camera refracts light. In the eye, the light rays from an object pass through the *cornea*, *aqueous humour*, *pupil, lens, vitreous humour* and finally fall onto the *fovea centralis* of the *retina*. The curved surfaces of both the *cornea* and the *lens* are responsible for bending the light rays perfectly so that a clear image is formed on the *fovea*. When the light rays strike the *photoreceptors* in the *retina*, the light impulses change into electric signals. These signals are transmitted through the *optic nerve* to different areas of the brain where they are recognised as colours, forms and movements. Brain structures process, connect and integrate this big amount of information so that it is possible to perceive it and understand the form, orientation, place and real size of the object. See figure 2.

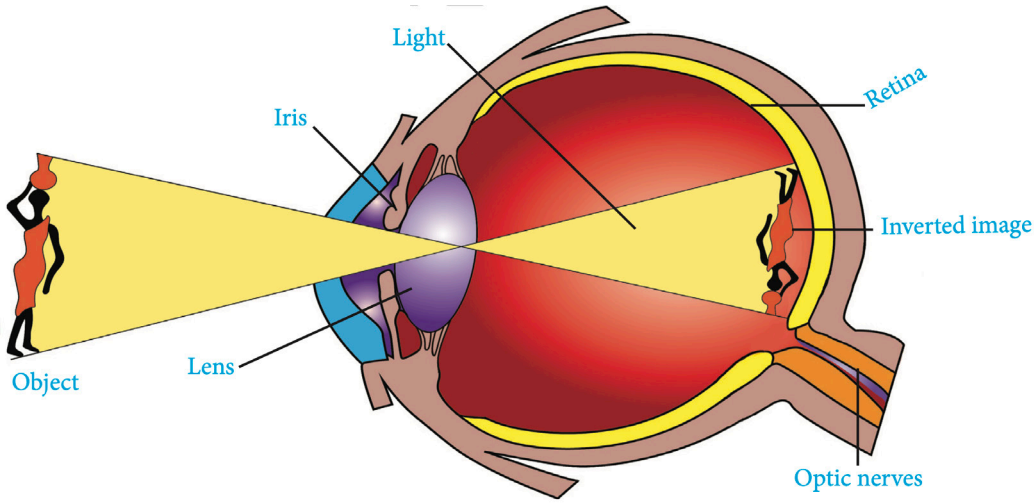


**Figure 2**: Light refraction by the human eye

1. What have you learnt about the concept of vision?
2. What challenges did you encounter in understanding the structure and mechanism of vision?
3. How did you overcome the challenges?

## Conclusion

There are various theoretical perspectives and viewpoints on the role of vision in reading. Cognitive psychology theory views reading as a complex process of collecting visual information. Visual information functions almost in the same way as the process of understanding a pictorial scene. A multitude of processing modules needs to work together on several levels to turn the array of combined visual features comprising letters into words and concepts that eventually form a mental representation of the text. In the theory that deals with perception and eye motor control, reading is seen as a visual-cognitive task in which visual inputs and perception form the basis for a systematic examination of the text. A text-page contains letters, words, lines of text and paragraphs. These form a hierarchy of visual symbols which must be seen in the correct order before they can give any meaning.

Several high-quality vision functions like visual acuity, contrast vision, accommodation and convergence are required in most school activities. Effective eye motor control plays a more important role in reading and learning processes than previously thought. Some of the learners with poor academic performance have disturbed vision functions. This necessitates teachers knowing how to identify and help such learners. Visual problems are often harmful to the educational achievement, if they are not recognised and might have lifelong consequences for the person and even for the wider society as educational and economic advances are lost.

Undetected visual problems relevant to learning do not face on by developing countries like Tanzania. They also face developed countries. The problems have different roots, depending on the specific situation obtaining in a country. In Tanzania, the eye health system does not have the resources for all children. This means that vision disturbances are not identified at an early stage and can therefore, distract the process of reading and learning. So, it is important for teachers to understand the anatomy of the eye, the mechanism of vision, visual functions, the consequences of vision challenges and educational methods for stimulation and compensation.

Bayram, A. G., Karagöz, K. I., Algun, Z. C. (2020). Investigation of the effect of different eye exercises on hypermetropia in school-aged children: A randomized single-blind trial. *Eastern Journal of Medicine*, 25(2), 234-240. Doi:10.5505/ejm.2020.80774

Carney, S., Engbretson, C., Scammell, K. & Sheppard, V. (2003). Teaching students with visual impairments. A gui*de for the Support team.* Saskatchewan Learning Special Education Unit. https://assistedtechnology.weebly.com/uploads/3/4/1/9/3419723/teachwithvi.pdf

Chan, V. F., Minto, H., Mashayo, E. & Naidoo, K. S. (2017). Improving eye health using a child-to-child approach in Bariadi, Tanzania. *African Vision and Eye Health*, 76 (1). Doi:10.4102/aveh.v76i1.406

Hornby, A. S. (2010). *Oxford Advanced Learner's Dictionary of current English.* (8th ed.). Oxford University Press. Oxford.

Kraff, C. (2022). *Amblyopia and Strabismus: What's the Difference?* Kraff Eye Institute. https://kraffeye.com/blog/amblyopia-and-strabismus-whats-the-difference

Kurtz, L. A. (2006). *Visual perception problems in children with AD/HD, autism, and other learning disabilities:* A guide for parents and professionals. London: Jessica Kingsley Publishers.

Mohamed, S. A. A. R. (2013). Vision Therapy-Based Program for Myopia Control in Adolescents. *Middle East Journal of Scientific Research*, 13(3), 390-396. Doi:10.5829/idosi.mejsr.2013.13.3.46

Melmoth, D. R., Finlay, A. L., Morgan, M. J. & Grant, S. (2009). Grasping deficits and adaptations in adults

with stereo vision losses. *Investigative Ophthalmology & Visual Science,* 50(8), 3711-3720.

Narayanasamy, S., Vincent, S. J., Sampson, G. P. & Wood, J. M. (2016). Visual demands in modern Australian primary school classrooms. *Clinical and Experimental Optometry*, 99(3), 233-240. Doi:10.1111/cxo.12365

NIH, National Eye Institute (2022). *Refractive Errors*. https://www.nei.nih.gov/learn-about-eye-health/eye-conditions-and-diseases/refractive-errors

Radach, R. & Kennedy, A. (2004). Theoretical perspectives on eye movements in reading: Past controversies, current issues, and an agenda for future research. *European Journal of Cognitive Psychology*, 16(1/2), 3-26.

Rogers (2011), The eye: *The physiology of human perception*, Britanica Educational Publishing, New York.

Singleton, C. & Henderson, L.-M. (2006). Visual factors in reading. *London Review of Education,* 4(1), 89–98. Doi:10.1080/13603110600574579

Sterner, B. (2004). *Ocular accommodation. Studies of amplitude, insufficiency, and facility training in young school children*. Doctoral Thesis, Gothenburg: University of Gothenburg.

van den Broek, P., Beker, K. & Oudega, M. (2015). Inference generation in text comprehension: Automatic and strategic processes in the construction of a mental representation. In E. J. O'Brien, A. E. Cook, & R. F. Lorch, Jr. (Eds.), *Inferences during reading*, 94–121. Cambridge University Press.

WHO (2022). *ICD-11, International classification of diseases 11th Revision. The global standard for diagnostic health information*. https://icd.who.int/en

Wilhelmsen, G. B. & Felder, M. (2021). Structured visual learning and stimulation in school: An intervention study. *Creative Education*, 12, 757-779.

MeyeSight (2017). Aspects of vision. Retrieved from http://www.meyesight.net/1e-aspects-vision/#:~:text=Three%20of%20the%20most%20important,the%20area%20of%20central%20vision.

# Unit Two

## Vision development

### 2.1 Introduction

Vision development begins before birth and continues through visual activities during childhood. It is a dominant process in the development of a child and influences the child's general development and daily performance. The brain must learn to interpret and understand a huge number of visual clues to determine whether an object is near or far away, moving or standing still. It must learn to visually separate the object from the background. The processing of visual information and tasks requires involving different parts of the brain. However, researchers cannot realy tell how much of the capacity of the brain is involved in vision activities because it is closely connected to several other brain structures responsible for body movements, emotions, hearing, language, etc. The vision function is estimated to occupy 70% of activities done at school. In this unit, you will learn about how vision develops through the first year of life and further through childhood. The knowledge gained will enable you to understand how vision is developed and how to take appropriate steps to help learners with vision disturbances so that they can read and learn better. This insight will also enable you to educate colleagues, parents and other people about the importance of vision in their lives.

In this unit, you are expected to develop the following competencies:

(a) Analysing vision development through the first year of life

(b) Analysing visual development through childhood

**Time: 90 Minutes**

1. In your class, watch a video clip of a baby looking at different moving objects. Look at the babies under the following age range:
   (a) A baby aged 1-6 months
   (b) A baby aged 1-5 years

Observe the vision actions and behaviour of the children in relation to the moving objects.

2. Use the knowledge gained to analyse vision development through the first year of life and through childhood.

1. How was the task?
2. How did it help you to understand visual development from birth through childhood?
3. If you were given another chance, how differently would you do the task?

## 2.2 Vision development through the first year of life

Vision is seen as our dominant sense and takes a leading part in children's learning and development. Language is to a large extent developed through information from the vision system. Different shapes, sizes, details and colours make it possible to remember the names of rather similar but different animals like the "lion" and the "cat". Vision is also involved in the development of social skills when children are playing and using non-verbal communication strategies, for example reading face expressions and body language. Good vision also motivates a child to do practical activities like building with blocks and play puzzle-games and ball games and thus, improve fine and gross motor functions. Motivation and the eagerness to do the activities repeatedly further develop vision qualities, vision eye-hand coordination and the understanding of space. Visual-manual oral coordination, object recognition, visual-spatial skills and how to use the environment also improve by doing activities.

1. What is my current understanding of vision in relation to language, social behaviour and motor skills development?
2. What should I do to know more about vision in relation to language, social behaviour and motor skills development?
3. What appropriate activities should I do to understand better vision in relation to language, social behaviour and motor skills development?

Subject syllabi, books, flip charts, marker pens, cards with words, pictures, natural materials, building blocks, balls and ropes

**Time: 180 Minutes**

Establishing the relationship between vision and language, social behaviour and motor skills development

**Steps**

1. Visit a nearby school or class.
2. Investigate the language development, social behaviour and motor development of learners.
3. Identify the indicators of deviation in language, social behaviour and motor development among the learners.
4. Discuss the findings with the class teacher. Suggest ways of helping learners with vision disturbances so that they can improve their learning.
5. Write a report and keep it in your portfolio.

1. How was the task?
2. How did it help you to understand vision in relation to language, social behaviour and motor skills development?
3. If you were given another chance, how differently would you do the task?

Identify activities that hinder learners with vision disturbances from developing language, social behaviour and motor skills easily.

1. How effective was the learning?
2. What did you not understand about vision in relation to language, social behaviour and motor skills development?
3. What do I need to do to understand better vision in relation to language, social behaviour and motor skills development?

Vision influences the development of language. Being able to see clearly helps learners to further improve their language, develop expected social behaviour and attain good motor functions. Learners with good vision can develop social behaviour more easily and do practical motor activities more precisely as well. Furthermore, vision enhances pre-teaching vocabulary and different concepts in reading. Without clear vision, learners may experience limitations in their learning activities, spatial understanding and practical performance.

## 2.3 Vision development through childhood

Vision is not fully developed when the child is born. A new-born baby has a visual acuity (VA) near low vision, around 6/60, 2/20 or 0.1. Light, large or

moving objects, and clear colours attract their attention. Their eye movements are not always well controlled in the first months but improve quickly. When children are three months old, they ought to be able to track an object. In the next half year, they discover their own hands, start grasping after objects, can see objects which are far away and have even developed some stereo vision. They manage to crawl towards objects of interest and when they are around twelve months old, they stand up and might start walking. At this stage, it is important to manage eye fixation so has to balance body structure.

Through different activities, vision develops further and at the age of 4 years, children ought to have a distance VA of 0.63 (20/35 or 6/9.5). Vision develops every year. 5–6-year-old children are found to have a distance VA of 0.8 (20/25 or 6/7.5), but a near VA of 0.63 due to immature accommodation. During the following years in school the VA develops further and near VA takes most of the time. When children turn 12-13 years, they have reached an adult level. This is also the case with the attention in the visual field; it improves with age. Therefore, young children are not able to read the traffic scene as quickly as older children are. Vision is also influenced by different activities later in life. Also, too long periods of near work, especially on computers or other electronic devices may result in myopia (near-sightedness)

If a child is not developing through the expected stages, an underlying vision problem may be the reason. Good vision is needed in exploring the world and doing most school activities. Reading involves serial and parallel stages of visual processing, sensorimotor coordination, cognitive, linguistic processes and is dependent on clear visual inputs from well-coordinated eyes. Eye movements like accommodation and convergence play an important role in all academic activities.

There is no best way to teach learners how to read. Learning to read is a developmental process that takes time. Every child learns differently, so it is important to incorporate several teaching strategies to hold their attention and

keep them interested in reading. Teaching students to read does not always have to be about formal lessons or worksheets. In fact, sometimes the best lessons are learnt when children do not even realise what they are learning. Clear vision and well-coordinated eye movements help a child to engage in visual activities like sport, games and practical activities relating to fine arts, sewing, farming and gardening. If a learner has vision disturbances, he or she is likely to do vision challenging activities poorly or even avoid them.

1. What is my current understanding of how reading starts as a vision process, visual pre-reading activities and the influence of vision on sport, games and practical activities?
2. What do I need to do to know more about how reading starts as a vision process, visual pre-reading activities and the influence of vision on sport and practical activities?
3. What appropriate activities should I do to understand well how reading starts as a visual process, visual pre-reading activities and the influence of vision on sport and games, and practical activities?

Simple games and sport, coloured manila sheets, marker pens, pictures, balls, marbles, word cards and children story books

**Time: 180 Minutes**

Comprehending reading as a vision process, visual pre-reading activities and the influence of vision on sport and games, and practical activities.

Do the following activities in a group:

1. Visit a nearby nursery school.
2. Investigate how the learners read.

3. Observe the visual pre-reading activities done at the school.
4. Assess how reading starts as a vision process and the influence of vision on sport and practical activities.
5. Discuss the findings of your investigation with your fellow teachers.
6. Write a report and keep it in your portfolio.

1. How was the task?
2. How did it help you to understand reading as a vision process, visual pre-reading activities and the influence of vision on sport and practical activities?
3. If you were given another chance, how differently would you do the task?

Assess reading as a visual process, vision pre-reading activities and the influence of vision on sport and games, and practical activities.

1. How effective was the learning?
2. What was not understood about reading as a vision process, visual pre-reading activities and the influence of vision on sport and games, and practical activities?
3. What do I need to understand better reading as a vision process, visual pre-reading activities and the influence of vision on sport and games, and practical activities?

Reading starts as a vision process. Clear, single visual inputs make it possible to do a further assessment of the word presented and to work out the meaning of a text. Visual pre-reading activities such as drawing and painting in early years can help a learner to read because these activities activate vision qualities and eye movements, especially accommodation and convergence. They also stimulate the orientation in space and the understanding of forms. Sport and games, and practical activities influence even active visual attention in the visual field, fixating on moving objects and accommodative adjustments between near and distant objects. The use of visual materials in pre-reading activities such as pictures, cartoons, puzzles and colouring tasks helps students to activate and build basic visual functions. Most outdoor activities depend on vision, eye-hand coordination and other body movements connected to visual inputs. Learners need many outdoor activities so that vision can develop for better learning and healthy eyes.This is especially important for preventing near-vision problems.

Outdoor activities might also influence learners to socialise more and be engaged in sport and games with their fellows.

1. What have you learnt about the concept of vision development?
2. What challenges did you encounter while studying this unit?
3. How did you overcome the challenges?
4. What would you like to learn more about the development of vision?
5. How would you use the knowledge you have gained to develop the vision of learners in classes, schools and the community?

## Conclusion

Vision develops through childhood and is influenced and affected by stimulation. Therefore, children's environment and opportunities play an important role in the development of vision and ocular motor functions. Better ocular motor control for close range and distant viewing is stimulated and strengthened through practice. The results are a better VA for near and distance, since accommodation is developing. This influences eye-hand coordination and results in better body movements, a quicker orientation in the surroundings and a better understanding of visual inputs. In measuring VA, the Snellen eye chart with rows of letters in decreasing sizes is the most commonly visual acuity test used. The Random E test uses a capital letter E, which gets smaller in size and changes direction (up, down, left and right). This test is completed when the learner cannot tell where the letter E is facing. The child can get cards with symbols or letters and match them with those on the chart.

In later years, LEA charts with the following symbols-the heart, a circle, house and a square are internationally recommended for screening children. Here, nobody expects the child to read letters and the child does not have to be afraid of failure. LEA charts are developed for screening the VA at 3 metres and another LEA charts are developed for a near VA at a reading distance of 40 cm. VA screening starts with reading larger symbols/letters and stops on the row with the smallest readable symbols/letters. Each eye must first be tested separately and then both eyes together. Different tests might give different results, so always report the results of the chart used in the evaluation.

However, VA is not everything. We all want uncorrected 20/20 (3/3 or 1.0) vision for near and distant viewing VA is just one facet of the visual capacity. Ophthalmologists can monitor the entire range of visual functions, including best corrected (with glasses or contact lenses) visual acuity, peripheral (side) vision, depth perception (seeing objects in three dimensions), eye movements

and the binocular (two-eye) function and tell the health of the retina. In addition, opticians check for the best refraction/correction and the binocular capacity. Specialised vision teachers do functional vision assessments; they evaluate how learners use their vision. The evaluation of VA and binocular functions is also included in the assessment. This is necessary for developing an adapted educational programme and for referring children with serious problems to health facilities. For children's very best, it is important that specialised health personnel and vision teachers understand each other and use the same terms for working smoothly together when necessary.

Baş, B., Karabulut, M. & Müjdeci, B. (2020). Evaluation of balance test outcomes in children with poor vision. *Cyprus J Med Sci*., 5(4), 284-288. Doi: 10.5152/cjms.2020.1156

Becker, R., Hübsch, S., Gräf, M. H., et al. (2002). Examination of young children with Lea symbols. *British Journal of Ophthalmology*, 86, 513-516.

Cook, E. (2022). Understanding your baby's developing vision. *Parents. Retrived from* https://www.parents.com/baby/development/physical/understanding-your-babys-developing-vision/

Dessalegn, B., & Landau, B. (2013). Interaction between language and vision: It's momentary, abstract, and it develops. *Cognition*, 127(3), 331–344. Doi: 10.1016/j.cognition.2013.02.003

Enthoven, C. A., Tideman, W. L., Polling, P., Yang-Huang, J., Raat, H. & Klaver, C. C. W.

(2021). The impact of computer use on myopia development in childhood: The Generation Study. *Preventive Medicine,* 132. Doi:10.1016/j.ypmed.2020.105988

Fazzi, E., Micheletti, S., Calza, S., Merabet, L., Rossi, A. & Galli, J. (2021). Early visual trainingand environmental adaptation for infants with visual impairment. *Developmental Medicine & Child Neurology*, 63(10), 1180–1193. Doi:10.1111 dmcn.14865

Graby, D. (1993). The Vision Thing: Mainly in the Brain. *Discover magazine*, June the 1st. https://www.discovermagazine.com/mind/the-vision-thing-mainly-in-the- brain#google_vignette

Kids Health (2022). Your Newborn's hearing, vision, and other senses. what can my baby see? https://kidshealth.org/en/parents/sensenewborn.html

Marsden, J., Stevens, S. & Ebri, A. (2014). How to measure distance visual acuity. *Community Eye Health*, 27 (85), 16. PMC4069781

Narayanasamy, S., Vincent, S. J., Sampson, G. P. & Wood, J. M. (2016). Visual demands in modern Australian primary school classrooms. *Clinical and Experimental Optometry*, 99, 233-240. Doi:10.1111/cxo.12365

Neto, C. A.M; Moreira, A.T& ,Moreira; L.B.(2014). Visual acuity in children of the elementary Curitiba. Opholomology, 73(4), 216-219.

Paul, C. M. & Sathyan, S. (2018). Comparison of the efficacy of Lea Symbol chart and Sheridan Gardiner chart for preschool vision screening. *Indian Journal of Ophthalmology,* 66(7), 924–928. Doi: 10.4103/ijo.IJO_1078_17

Roque, L. S. et al. (2014). Vision verbs dominate in conversation across cultures, but the ranking of non-visual verbs varies. *Cognitive Linguistics*, 26(1), 31-60. Doi:10.1515/cog-2014-0089

The eye clinic (2022). *What is infant vision?* https://www.theeyeclinic.ca/Vdev-Infant-Vision.htm

Wilhelmsen, G. B. (2012). Children's functional vision. Provides visual impairments not classified to ICD-10 needs for action? *[Barns funksjonelle syn. Gir synsvansker som ikke klassifiseres etter ICD-10 behov for tiltak?]* Project report, HiB.

Wilhelmsen, G. B. & Knudsen, E. (2021). Reading starts as a vision process. Chapter 6 in B.

Hvidsten, I. Kyginyte-Arlauskiene, G. Söderlund (Eds), Adapted education and special needs education in theory and practice. [*Tilpasset opplæring og Spsialpedagogikk i teori og praksis*]. Fagbokforlaget.

Willings, C. (2019). Language Development. *Teaching Students with Visual Impairments*. https://www.teachingvisuallyimpaired.com/language-development.html

Xiong, S., Sankaridurg, P., Naduvilath, T., Zang, J., Zou, H., Zhu, J., ... & Xu, X. (2017). Time spent in outdoor activities in relation to myopia pr vention and control: a metal analysis and systematic review. *Acta ophthalmologica*, 95, 551 566. Doi: 10.1111/aos.13403551

MeyeSight (2017). Aspects of vision. Retrieved from http://www.meyesight.net/1e-aspects-vision/#:~:text=Three%20of%20the%20most%20important,the%20area%20of%20central%20vision.

# Unit Three

## Screening and assessment of vision

### 3.1 Introduction

Researchers find visual disturbances among several learners in every class and vision is very important for learning, it is important to screen learners' visual capacity early. Early detection can prevent problems from getting worse. Useful screenings include visual acuity for short and far distance, convergence and accommodation, saccades and fixation, smooth pursuits and colour vision. However, vision screening must be planned and organised well. Those who screen others should be well prepared. It is necessary to have a list of the children to be screened and to know when to screen them. Screening results must be recorded and communicated to a child's parents if possible. In this unit, you will learn about screening and how to identify learners with vision disturbances. The knowledge gained will enable you to apply different screening and identification methods and evaluate assessment practices and procedures in screening the vision of the learners in your school for better learning purposes.

In this unit, you are expected to develop the following competencies:

(a) Screening and identifying learners with vision disturbances

(b) Assessing learners with vision disturbances

**Time: 40 Minutes**

Screening, identification and assessment of vision

**Steps**

1. In groups of three to five, discuss the following tasks:
   (a) Explain the concept of screening and identification of vision disturbances.
   (b) Describe the tools used in assessing the vision disturbances of learners.
3. Present your work to your fellows and make corrections, depending on the inputs given.
4. Keep your summary report in your portfolio.

1. How was the task?
2. How did it help you to understand the screening, identification and assessment of vision?
3. If you were given another chance, how differently would you do the task?

## 3.2 Screening and identifying learners with vision disturbances

Screening is a relatively short examination that can indicate the presence of vision problems or potential vision problems in someone. Selecting the vision screening method to be used depends on the screening venue, the availability of screening personnel, the time allotted for screening and financial resources. A vision screening programme should consist of single cost-effective tests that can be rather quickly and easily carried out by non-medical personnel to the target population in any environment. Vision screening requires insight and competence to know the test rules and to understand the results.

1. What is my current understanding of the screening and identification of learners with vision disturbances?
2. What do I need to do to know more about screening and identification of learners with visual disturbances?
3. What activities are appropriate to do to understand more the screening and identification of learners with vision disturbances?

Dolls, a ruler, a pen, a pencil, an eye patch, a grey occluder, marker pens, strings, a marsden ball, needles, beads, a snellen chart, a pinhole occlude and screening forms

**Time: 180 Minutes**

Screening and identifying learners with vision disturbances

In a group of three to five, conduct a project on screening and identifying learners with vision disturbances through the following **steps:**

1. Collect and organise screening and identification tools.
2. Conduct peer screening at campus.
3. Under supervision, screen children in neighbouring schools and at home.
4. Write a report and file it in your portfolio.

1. How was the task?
2. How did it help you to understand how to screen and identify learners with vision disturbances?
3. If you were given another chance, how differently would you do the task?

1. Briefly explain how to use visual screening tools.
2. With vivid examples, explain the procedure for planning the screening of learner?
3. How will you screen children of different ages in a neighbouring school?

1. How effective was this this task?
2. What challenges did you encounter while screening and identifying the learners' vision disturbances?
3. What else do I need to do to understand well the screening and identification of learners with vision disturbances?

Vision is an important requirement in learning and plays a critical role in the development of children. Learners use sight to strengthen their motor functions, establish parent-child bonding, build pictorial perception and gain balance. Children with vision problems may enter school. Sub-optimal vision could lead to poor school performance, lack of interest in schooling and dropping out of school. Sometimes an underlying vision disturbance can lead to behavioural problems, learning disabilities, reading problems categorised as dyslexia or attention deficit disorders. Vision disturbances can cause many problems as alreaady mentioned. It is important that teachers understand these connections and that special trained teachers know how to screen, identify and assess learners in order to treat them fairly during their learning process.

## 3.3 Assessment of vision

Assessment of vision is crucial in learning. It includes very important things; for example how to measure visual acuity (VA) near or at a distance using different tools and tests, both objective and subjective tools and tests. It includes

evaluating accommodation (using push-up tests) and convergence (on using push-up tests, as well as evaluating eye movements like smooth pursuits, binocular vision (using cover tests), saccades and fixations. Assessment also looks at how the learner is functioning in relation to reading, writing, other academic activities and in sport. It is necessary to write the results in a clear way so that others can understand the reports and the results can be compared with future assessment results.

### 3.3.1 Visual acuity

Visual acuity (VA) is a measure of the ability to distinguish shapes and details of objects at a given distance. It is important to assess VA in a consistent way to detect the VA level and to evaluate any changes in vision. During VA testing, each eye is evaluated separately. It is a good idea to start with the right eye, then the left eye and finally both eyes together. The VA has to be evaluated at a distance and near. Distance VA is measured at 3 metres or 6 metres depending on the guidelines of the relevant test. Actual tests are the LEA symbols for a distance test, the Snellen or the E chart. For measuring near VA (40 centimetres), the LEA symbols chart for near is the actual test for measuring VA. Apart from standardised tools, improvised tools can also be used to measure VA, but such tools are less precise.

1. What is my current understanding of visual acuity (VA)?
2. What more do I need to know about VA?
3. What appropriate activities should I do to understand VA better?

Subject syllabi, books, the snellen or E-chart, LEA symbols (near and distant), dolls, a brock string, number charts, flip charts, marker pens (different colours), beads and threads

**Time: 180 Minutes**

Assessing visual acuity

Visit a nearby school and engage learners in different activities such as threading, throwing and catching balls. Let them also walk and run in a straight line; guide the activitie through the following steps:

1. Observe the learners as they do the activities.
2. Identify those who perform well and those who do not perform well.
3. Use the testing procedures for VA near and at a distance (objective or subjective) to measure the VA of those who underperformed.
4. Suggest measures to improve the VA of the learners who underperformed.
5. Write a report on the results and keep it in your portfolio.

1. How was this task?
2. How did it help you to understand visual acuity?
3. If you were given another chance, how differently would you do the task?

1. In your own words, write about visual acuity.
2. Briefly explain the procedures followed in measuring near and distant visual acuity?

1. How effective was the learning?
2. What did not go well in learning about visual acuity?
3. What else do I need to understand visual acuity well?

You have read about visual acuity and how to measure it. On the basis of your understanding, build competencies that will help you to measure near and distant VA to detect vision disturbances among learners. There are a variety of tools that could be used in measuring VA: The Snellen or the E-chart for measuring distant VA, or LEA symbols for measuring both near and distant VA. It is recommended that standardised tools should be used, but, where standardised tools are not available, improvised ones could be used instead. There are online possibilities for measuring VA. Only teachers who have good knowledge of vision screening should use improvised tools to find out if a child has VA-related challenges or not.

### 3.3.2 Accommodation and convergence

Accommodation is the focusing system of the eyes. When a text is moved closer or further away, the accommodative system must adjust the lens to keep the inputs clear. The accommodative system must be precise and flexible. The ciliary muscle, which is responsible for accommodating the eye lens is relaxed when the eyes are focusing on a distant object, an object that is more than six metres away. When one is looking at a near point, the ciliary muscle is contracted and the lens becomes rounder and gets a stronger refraction strength. This is necessary for receiving clear pictures of near activities like reading, drawing, writing, sewing and knitting, and other activities done at a short distance.

Convergence is the ability to turn both eyes inwards so as to focus on the same near object. At the same time, the lens must be accommodated so that the image is clear. When both eyes focus on the same object, the brain sees only one image. If not, the image is doubled. When both eyes work well together, there is binocular vision. Without good eye teaming, convergence tasks are hard to do.

It is necessary to prevent the child from having double vision. Home-based activities to stimulate the child's convergence capacity may include threading beads, putting a string in a needle, colouring shapes and figures, separating and collecting small stones by throwing one up and catching it using one hand (mdako), searching for letters or words in a text and playing different ball games.

**Figure**: Teacher assessing acommodation and convergence.

1. What is my current understanding of accommodation and convergence?
2. What else do I need to know about accommodation and convergence?
3. What appropriate activities should I do to understand accommodation and convergence well?

Strings, threads, shoes and laces, balls, beads, needles, cards of different colours, marker pens, flip charts and tennis

**Time: 120 Minutes**

Assessing accommodation and convergence

In a pair, do the following:

1. Identify the tools and procedures for assessing accommodation and convergence.
2. Use the tools and procedures identified to assess accommodation and convergence.
3. Write a report and put it in your portfolio

1. How was the task?
2. How did it help you to understand the assessment of accommodation and convergence?
3. If you were given another chance, how differently would you do the task?

Explain how vision accommodation and convergence are linked to different daily activities.

1. How effective was the learning?
2. What challenges did you face while learning about accommodation and convergence?
3. What else do I need to understand the concept of accommodation and convergence?

The eye has a unique mechanism by which we focus on the diverging rays coming from a near object on the retina. This mechanism is called accommodation. Accommodation is the mechanism by which the eye changes reflectively the refraction power by alternating the shape of the *lens* to get a clear input at variable distances. Convergence is the rotation of the two eyes inwards when one is looking at a near object. When one is looking at a distant object, the eyes move by rotating outwards to a parallel position, that is, divergence. We depend on this visual skill while doing near activities like reading something on a smartphone, in books, and in sports when catching a ball. Hence, accommodation and convergence are important to the vision of learners.

When the eyes are not converging well together, there is *Convergence Insufficiency*, which results in blurry and double vision. It may also lead to a headache, concentration problems and dizziness. Accommodation and convergence can be improved with exercises, as shown in the activities that stimulate accommodation and convergence.

### 3.3.3 Eye movements

The visual system represents a well-developed sensory system in humans, who are highly dependent on vision for organised response to their environment. The region of the eye that is responsible for sharp central vision is the fovea. Thus, in order for one to see, images of objects of interest should fall on the fovea, a special depresion in the retina of an eye. This is achieved through various sets of eye movements, which work together to keep the image of the target object on the fovea. It has, therefore, been discovered that a large part of the human brain is devoted to eye movements.

Various scholars define the concept of eye movement in different ways. However, eye movements simply refer to the process that

involves moving every spot of the eye in its circuit. There are different types of eye movement. The basic eye movements are fixation, saccades, vergence (binocular vision) and pursuit movements. These movements need to be as intact as possible because they are very important for smooth reading.

1. What is my current understanding of eye movements?
2. What else do I need to know about eye movements?
3. What appropriate activities should I do to understand eye movements well?

Pens, pencils, cards, marker pens, rulers, and smalls dolls

**Time: 180 Minutes**

Assessing eye movements

In groups, visit a school and do the following tasks:

1. Prepare the assessment room and tools for screening eye movements.
2. Familiarise yourselves with the leaener.
3. Assess the eye movements.
4. Record the behaviour and movements of the learner's eyes.
5. Share your findings with the learner and guardians or parents.
6. Write a report and keep it in your portfolio.

1. How was the task?
2. How did it help you to understand eye movements?
3. If you were given another chance, how differently would you do the task?

1. Briefly explain different types of eye movement.
2. Explain how eye movements work and why they are important in the learning process.

1. How effective was the learning?
2. What challenges did you face while learning about eye movements?
3. What else do I need to understand better about eye movements?

As a teacher, you need to be able to identify learners with vision disturbances and eye movement challenges. Regarding the basic types of eye movements, fixation is the ability to aim the eyes to a particular spot accurately, while saccades are quickmovements when the gaze jumps to new positions for fixation. The eyes must do these simultaneously, in the same direction and in a very coordinated manner to pass on image. These involve information from the visual field, which stimulates the gaze to move quickly, making a saccade to a spot of interest. It might be a car coming, a bird in the sky or the next word in a line. Saccades are used for placing the stimuli of interest on the fovea. Only when the fovea is used can the image be seen with the very best visual acuity. In other words, it is a series of quick eye movements. Saccadic dysfunctions negatively influence reading. If saccades are problematic, the learner might use head movements as a compensationary strategy. The result can be seen as a frequent loss of place in the text, omission of words, line skipping, slow reading speed and poor comprehension. Children who have these symptoms might also have difficulty copying things from the board and solving math problems with columns of numbers.

Smooth pursuit is another type of eye movement in which the eyes remain fixated on moving objects. Symptoms of poor pursuit are often head movements during reading and poor perfomance in sport. When you observe a child, the eye movements seem to jerk quickly or jiggle like a tremor when the eyes cross the midline. When you assess a child, he/she should sit in front of you at an arm's length. Hold up an object that the child must look at with both eyes, such as a pencil, directly in front of the child and slowly move it in a left-right and right-left horizontal direction.

You should also test one eye at a time by asking the child to cover one eye. It might also be of interest to let the child follow the object vertically and diagonally to see if the eyes are following each other in all directions. Always encourage the learner to keep the head steady. Only the eyes shall move. Binocular vision can only be reached with two well-coordinated eyes and is necessary for depth perception and stereo vision. Good eye teaming allows for sustained single and comfortable vision. Binocular vision can be evaluated using a cover test, which involves asking the child to fixate on a target like a doll or a pencil. One eye is occluded and the other is not. The fixation target is moved slowly towards the area between the eyes. The un-covered eye is observed to see that it follows the target. In the area between ten and six centimetres from the eyes, the cover is removed. It is important to observe the gaze position when the cover is removed. Is it focused on the target or is it focused on another position? If it is focused on another position, there is an unbalance between the eyes.

The cover test is repeated with the other eye. Essentially, the test is used to measure eye alignment and to figure out whether one eye is working harder than the other.

The test can also be used for learning how the learner is focusing on both distant and near objects. A learner with disturbed accommodation and binocular vision may experience blurred vision, a headache, an eye ache or an eye stain, fatigue or tired sensation.

### 3.3.4 Report writing and reflection on vision screening and assessment

After collecting all the information, you can write a report. The purpose is to communicate your findings in writing to professionals and parent in a manner that enables them to understand the infomation. As a teacher, you should know how to conduct a vision assessment and write an assessment report about your findings. You must describe the tests, identify the challenges and determine how to work further with a learner with vision disturbances.

1. What is my current understanding of report writing and reflection on vision screening and assessment?
2. What do I need to do to know more about report writing and reflection on vision screening and assessment?
3. What appropriate activities should I do to understand better report writing and reflection on vision screening and assessment?

Books, notebooks, pens, pencils, cards, marker pens, a ruler and flip charts

**Time: 150 Minutes**

Report writing and reflection on vision screening and assessment

In groups, do the following tasks:

1. Do a library search on report writing to reflect on vision screening and assessment.
2. Examine the features of a report on screening and assessment of vision.
3. Discuss the importance of screening and assessment reports and reflection on vision.
4. Write a sample report and share it with your fellows.
5. Keep it in your portfolio.

1. How was the task?
2. How did it help you to understand report writing and reflection on vision screening and assessment?
3. If you were given another chance, how differently would you do the task?

1. Explain the importance of writing reports on vision disturbances.
2. Explain how report writing and reflection on vision screening and assessing are important in the learning process.

1. How effective was the learning?
2. What challenges did you encounter when learning about report writing and reflection on vision screening and assessment?
3. What else do I need to understand better report writing and reflection on vision screening and assessment?

As a teacher, you should write a vision assessment report, depending on the individual needs of the learner. There must be a report on every learner. The report may have the following elements:

**The tittle page:** Official reports often have a title page to keep things organised. If a person must read multiple reports, the title pages make them easier to keep track off.

**Table of contents:** The table of contents helps the reader to go directly to the section of interest, thus allowing for faster browsing.

**Page numbering:** Page numbering helps to make sure that pages are in correct order, in case of mix-ups or misprints.

**Headings and subheadings:** Reports are typically divided into sections and sub-sections with headings and sub-headings to facilitate browsing and scanning.

**Citations:** If you are quoting information from another source, the citation guidelines tell you the recommended format.

**The works cited page:** This page includes the sources from which you got information.

1. What new information have you learnt which you would like to use in your classroom in future?
2. What else do you want to learn about vision screening and identification? Why?
3. What challenges did you face while studying this unit?
4. Did you solve the challenges?

## Conclusion

The importance of vision screening, identification and assessment among learners helps to ensure that the learners' visual issues are identified. The goal is to help the learners to succeed academically and socially. School vision screening is important and can help to detect eye problems and other vision-related challenges. Early detection of vision problems has a positive impact on the quality of life for learners. Some vision disturbances can easily be observed, for example eyes turning inwards or outwards, headaches, squinting, worsening academic performance, blurred or double vision, loosing place when reading, avoiding close work, holding reading material closer than normal, rubbing eyes, eyes tiring while one is reading or doing other school work, turning or tilting the head to use only one eye, making frequent reversals when one is reading or writing and using a finger to maintain the actual place when one is reading.

AOA, American Optometric Association (2022). Convergence insufficiency. https://www.aoa.org/healthy-eyes/eye-and-vision-conditions/convergence-insufficiency?sso=y

Bringmann, A., Syrbe, S., Görner, K., Kacza, J., Francke, M., Wiedemann, P., & Reichenbach, A. (2018). The primate fovea: structure, function and development. *Progress in retinal and eye research*, *66*, 49-84.

Cotter, S. A., Cyert, L. A., Miller, J. M., Quinn, G. E., & National Expert Panel to the National Center for Children's Vision and Eye Health (2015). Vision screening for children 36 to <72 months: recommended practices. *Optometry and vision science*, 92(1), 6–16. Doi:10.1097/OPX.0000000000000429

Ellis, M. (2021). How to write a report. A guide. https://www.grammarly.com/blog/how-to-write-a-report/

Lal, V., & Truong, D. (2019). Eye movement abnormalities in movement disorders. *Clinical Parkinsonism & Related Disorders*, *1*, 54-63.

Land, M. F. (2006). Eye movements and the control of actions in everyday life. *Progress in retinal and eye research*, *25*(3), 296-324.

Lane, A. (2005). Developing ocular motor and visual perceptual skills: *An Activity Workbook. SLACK* Incorporated. USA

Liversedge, S., Gilchrist, I., & Everling, S. (Eds.). (2011). *The Oxford handbook of eye movements*. OUP Oxford.

Kim, H., Lee, E. H. & Oh, H. (2012). Measurement of amplitude of accommodation using push-up and push-away and near point of convergence in elementary School children. *journal of korean ophthalmic optics society*, 17 (3), 279-284.

Kolb, H., Nelson, R. F., Ahnelt, P. K., Ortuño-Lizarán, I., & Cuenca, N. (2020). The architecture of the human fovea. *Webvision: The Organization of the Retina and Visual System [Internet]*.

Plainis, S., Charman, N. W. & Pallikaris, I. G. (2014). The physiologic mechanism of accommodation. *Across the pond*, april. https://crstodayeurope.com/articles/2014-apr/the-physiologic-mechanism-of-accommodation/

Rucker, J. (2010). Eye movement abnormalities in movement disorders. *Encyclopedia of Movement Disorders*, *1*, 462.

Unite for Sight (2022). *Global Health University: Excellence in Global Health Education* https://www.uniteforsight.org/global-health-university/

White, S. L. J., Wood, J. M., Black, A. A. & Hopkins, S. (2017). Vision screening outcomes of Grade 3 children in Australia: Differences in academic achievement. *International Journal of Educational Research*, 83, 154-159. Doi:10.1016/j.ijer.2017.03.004

Wilhelmsen, G. B. (2016). *School starter's vision: An Educational approach*. Bergen University College, Norway

Wilhelmsen, G. B. (2018). *Vision for reading and learning: My Idea Book*. HiB

Wilhelmsen, G. B. & Felder, M. (2021). About the importance of vision screening by teachers in schools: A study from Tanzania. *Improving Schools*, 1-18. Doi:10.1177/13654802211004

# Unit Four

## Vision in reading

### 4.1 Introduction

Reading is a complex and useful activity which gives us the ability to collect and access information. It gives us pleasure when reading literature. Reading skills have evolved through generations and have become more important in our lives. Reading involves several processes but it starts as a visual process. Sensorimotor which is coordination includes several eye movements which must be precise and coordinated. In addition, reading requires cognitive and linguistic processes. In this unit you will learn about normal reading development, reading problems, how vision functions in reading, vision-related challenges in reading and how viewing conditions influence reading. These competencies will enable you develop a better way of helping learners with vision disturbances.

In this unit, you are expected to develop the following competencies:

(a) Evaluating normal reading development;
(b) Analysing reading problems;
(c) Determining the influence of vision on reading;
(d) Analysing the vision-related challenges relating to reading; and
(e) Assessing the viewing conditions that influence reading.

**Time: 120 Minutes**

In a group of three to five, learners should read different words written on cards, books, computers and on the board. Lead the learners through the process of reading the words. Analyse their reading problems/challanges as they read and determine the influence of vision on reading. Analyse vision-related challenges they are facing and assess the viewing conditions that influence reading. Write a report and keep it in your portfolio.

1. How was the task?
2. How did it help you to understand vision in reading?
3. If you were given another chance, how differently would you do it?

## 4.2 Normal reading development

Reading is a process that involves recognising words. It is a precess that leads to the development of comprehension. According to Aghababian and Naziri, 2000, reading is a process that negotiates the meaning between the text and its reader. Normal reading development refers to the typical stages for tracking readers' progress without reading difficulties related to gross visual problems such as visual disturbances. .

### 4.2.1 Reading in education

In education, reading involves learning the names of letters, connecting them to words, recognising words, placing them correctly in sentences and understanding their meaning. Reading is one of the four language skills. Getting the meaning of a text also requires paying attention to punctuation and the space, which are mostly small signs presented in a given order. The brain converts these visual inputs into words and sentences that give a certain meaning. It is also necessary to prepare

the gaze in order to place the fixation in the next word. In order to perceive this information, we use the right visual field. When the text line has already been read, the eyes must do a long movement to the left where the next line starts. After these challenging visual sensory, motor and perceptual activities, the brain must understand the meaning of the words (comprehension). For young or immature readers, this physical activity is so exhausting that they might not get the meaning of the text the first time they read it.

1. What do I understand about reading in education?
2. What else do I need to understand better reading in education?
3. How could I understand well reading in education?

Cards, flip charts, marker pens, mobile phones, computers, tablets and different written texts

**Time: 20 Minutes**

Reading in education

**Steps**

1. In groups of three to five, use internet sources to read about the concept of reading in education.
2. Discuss what you have read.
3. Summarise what you have discussed; then keep the summary in your portfolio.

1. How was the task?
2. How did it help you to understand reading in education?
3. If you were given another chance, how differently would you do the task?

1. Briefly explain the meaning of reading in education.
2. With vivid examples, explain the importance of reading in education.

1. How effective was the learning?
2. What did not go well while you were learning about normal reading development?
3. What else do I need to understand normal reading development better?

Reading is a receptive skill that allows us to receive information through vision. You learn something new or reinforce what you already know. Reading might improve concentration if the text is motivating. Meaningful reading can attract attention and help one to learn how to focus on the skills and knowledge which have been gained or achieved for a long period.

Through reading, you can:

(a) Expand the amount of knowledge you have; this might lead to you having more self-confidence.

(b) Expand your vocabulary, which influences communication and helps you to build self-confidence.

(c) Attain more knowledge across the curriculum, which boosts self-esteem.

(d) Be stimulated to get into new challenges and to think in new ways.

(e) Develop the creative side of the brain by exposing it to unique or unfamiliar ideas.

(f) Process descriptions by putting them into mental pictures.

Reading can only be successful if there are clear visual inputs and precise binocular movements of the eyes across a page. This is needed for encoding the text. Encoding enables the brain to form a visual or non-visual code of the word and to place it in the working memory. This memory is important for writing. Even writing must be seen as being more than a verbal activity because vision and the understanding of space play essential roles in writing.

### 4.2.2 The effects of teaching materials and reading strategies on vision

Teachers use different approaches and different kinds of aids to make the learning and teaching process effective. But the teaching materials and reading strategies chosen may not always be suitable for learners with vision disturbances.

1. What do I know about the influence of teaching materials and reading strategies on vision?
2. What else do I need to understand well the effects that teaching materials and reading strategies have on vision?
3. How could I understand better the effects of teaching materials and reading strategies on vision?

Cards, flip charts and different texts

**Time: 120 Minutes**

Teaching materials and reading strategies related to vision and vision problems

**Steps**

1. Visit a nearby school.
2. Prepare a lesson and teaching materials which you are going to use during the lesson.
3. Do an assessment while talking about how the teaching materials and reading strategies relate to vision and what effect vision disturbances might have on learning.
4. Summarise what you have observed; then keep the summary in your portfolio.

1. How was the task?
2. How did it help you to understand the kinds of vision challenges the teaching materials and reading strategies cause?
3. If you were given another chance, how differently would you do the task?

1. Briefly explain how the teaching materials and reading strategies related to vision and the consequences of visual disturbances for a learner.
2. With vivid examples, explain the effects of poor teaching materials and reading strategies on learners with visual disturbances.

1. How effective was the learning?
2. What challenges did you meet as you evaluated the effects of teaching materials and reading strategies on vision?
3. What else do I need to understand better the effects of teaching materials and reading strategies on vision?

Visual aids are normally used to reach learners' interests and help teachers to simplify the process of teaching. In the Tanzanian school setting, the visual aid that is mostly used is the blackboard. Pictures, models, charts, maps and real objects are also used. It is important that all the information presented and illustrated with visual aids is seen by all learners. Sometimes it is necessary to let the learners at the back of the classroom see the details on models, maps or pictures. Alternatively, pass a model around the classroom so that all the learners can study it. The words, numbers and figures written on the blackboard must be large, have enough space around them and be presented with good contrast so that everyone can see them. Learners with vision disturbances are entirely dependent on good teaching instructions and clear visual materials. When visual information is very little or complex the teacher must use explanation.

Vision is important in teaching and learning. An improper or poor use of teaching and learning strategies may prevent learners with vision disturbance from learning. They might misunderstand the concepts presented and miss out the skills or knowledge imparted to them.

### 4.2.3 Reading and the mother tongue

Through reading, learners learn new words and perspectives. Reading helps them to strengthen their language and sharpen sentence structure. A mother tongue is the language that a child's mother and father speak or the language from which other languages are formed. It can influence reading through the pronunciation of certain words. Some of the problems we encounter for not using the mother tongue in reading are:

(a) A learner cannot grasp the content or assimilate it as much as he or she would if it were presented in his or her mother tongue;

(b) A learner cannot pronounce the vocabulary properly while reading; and

(c) Some technical terms may be hard to learn because they do not have any equivalents in the mother tongue.

1. What do I understand about the relationship between reading and the mother tongue?
2. What else do I need to understand better the relationship between reading and the mother tongue?
3. How could I understand the relationship between reading and the mother tongue better?

Cards, flip charts and different texts

**Time: 40 Minutes**

The influence of the mother tongue on reading

**Steps**

1. Visit a nearby library.

2. Read different texts on how the mother tongue influences reading.
3. Write a summary on what you have read; then keep the summary in your portfolio.

1. How was this task?
2. How did it help you to understand the relationship between reading and the mother tongue?
3. If you were given another chance, how differently would you do the task?

1. Briefly explain the effect of the mother tongue on reading.
2. Write a short note on how you would help learners who are affected with their mother tongue in reading.

1. How effective was the learning?
2. What challenges did you face when you were learning about the relationship between reading and the mother tongue?
3. What else do you need to understand better the relationship between reading and the mother tongue?

The development and growth of any society largely depends on a language which links people together. In other words, a people's culture cannot be fully appreciated without the use of language, which conveys the culture. Therefore, people who lose their language lose their culture as well and cannot be identified as people; they become people without any identity and perhaps they will be assimilated into another culture. Alimi et al. 2020 claim that language is the most important

vehicle of a people's culture. Language differentiates us from other animals and gives us the tool for passing thoughts and experiences on to other generations.

## 4.3 Reading difficulties

A variety of terms are used to describe learners' reading problems. They vary from setting to setting and from group to group such as group of educators or health-care providers. When reading problems are identified from a normative perspective, reading performance is compared with the performance of peers or people's educational expectations. Reading problems have several causes and in some cases, more than one cause is involved at the same time.

### 4.3.1 Dyslexia

Between 1877 and 1900, some ophthalmologists and neurologists described the phenomenon of people who could see but could not read. They called the *phenomenon congenital word blindness*. Today, children expiriencing reading diffuculties often get the diagnostic label dyslexia, which implies reading.

1. What do I understand about reading problems/difficulties?
2. What else do I need to know more about reading problems/difficulties?
3. How could I learn more about reading problems/ difficulties?

Cards, flip charts and different texts

**Time: 120 Minutes**

The relationship between dyslexia and other reading problems.

**Steps**

1. Visit a library and read different sources about dyslexia and reading problems.
2. Summarise what you have read about dyslexia.
3. Present it in class.
4. Make corrections, depending on the inputs given by your fellow teachers.
5. Keep the summary in your portfolio.

1. How was the task?
2. How did it help you to understand the term dyslexia?
3. If you were given another chance, how differently would you do the task?

1. With vivid examples, explain reading problems in relation to dyslexia.
2. Do all learners with vision disturbances have dyslexia? Discuss.

1. How effective was the learning?
2. What challenges did you face when learning about reading problems?
3. What else do I need to understand reading problems better?

In a broad sense, dyslexia refers to significant difficulty with word reading, decoding and spelling, as evidenced by low accuracy and/or fluency in standardised assessments. Dyslexia as a problem with translating prints into speech and includes the risks and deficits shown in Table 6.

**Table 6:** Deficits and elements of high risk related to dyslexia (Hulme & Snowling, 2016)

| Deficit | High risk of dyslexia |
|---|---|
| Low phoneme awareness | Family risk of dyslexia |
| Problem with letter-sound knowledge | Persistent language difficulties at school entry |
| No rapid automatised naming | Early oral language difficulties |
| Hard to recognise printed words | Low literacy environment |
| Problems with learning to decode | Language delay |
| Reading slowly | Low level of print exposure |

There are many theories on what dyslexia is and what causes it. Also is often accompanied by vision.

### 4.3.2 General reading difficulties

Reading difficulties can be caused by poor teaching methods, an incompetent and limited learning environment, little support from home as well as individual challenges. Serious vision impairments mostly arise from complications after measles or rubella, nutrition deficiency, improper or inadequate treatment of eye infections and the lack of vitamin A. Other vision problems like amblyopia, binocular problems and reduced vision attention have more unknown causes.

1. What do I understand about the general reading difficulties?
2. What else do I need to understand better general reading difficulties?

Cards, flip charts, pictures, marker pens, texts and computers

**Time: 120 Minutes**

General reading difficulties

**Steps**

1. Visit a nearby library and read different sources about reading difficulties.
2. Summarise what you have read.
3. In groups of three to five, discuss the general reading difficulties facing the learners in your class.
4. Present the work in class and make corrections, depending on the inputs given by your fellow teachers.
5. Write a summary report and keep it in your portfolio.

1. How was the task?
2. How did it help you to understand general reading difficulties?
3. If you were given another chance, how differently would you do the task?

1. Explain the different learning difficulties that face the learners in your class.
2. Do all the learners have reading difficulties? Discuss.

1. How effective was the learning?
2. What challenges did you encounter when learning about general reading difficulties?
3. What else do I need to understand general reading difficulties better?

The stress and challenges associated with learning and reading difficulties can make life taxing. Not being able to read or comprehend the words on a page makes it almost impossible for someone to learn. Suffering from reading and learning disabilities makes it hard to learn and comprehend important information at school and at work. The following might be the reasons for general reading problems or difficulties: Poor vision, hearing loss, improper directional tracking, poor comprehension skills, and issues with decoding, Attention Deficit Hyperactive Disorder (ADHD) and dyslexia.

## 4.4 Vision in reading

Reading is the ability to gather information from pages. It is a complex activity which involves several visual and non-visual factors such as motivation and one's cognitive ability. During reading, normally word recognition is done automatically by the reader. However, when the reading speed is slow due to vision disturbances, the reader will have to use extra energy to recognise the word.

### 4.4.1 The influence of visual acuity on reading

Researchers have found that 20-40 % of learners have vision-related challenges' that influence their reading and learning. A reduced distant visual acuity (VA) interferes directly with copying things from the blackboard. A reduced distant VA can also affect the ability to know what to copy and how words are spelt. In learning to read, it can be a challenge to see the letters presented and similar forms might be mixed with each other.

Little attention has been directed to near visual acuity and reading. Near visual acuity is seldom evaluated, although it affects one's ability to distinguish shapes and details of objects at a reading distance. It is also important to assess near visual acuity to understand the learner's visual prerequisite for reading.

1. What do I understand about the relationship between visual acuity and reading?
2. What else do I need to understand better the relationship between visual acuity and reading?
3. How could I understand visual acuity and reading better?

Multi-letters, the Snellen or an E chart, the LEA chart, a plain occluder, cards or tissues, a pinhole occluder, a torch or flashlight and a patient's documentation

**Time: 180 minutes**

Conduct a control case study of a visual acuity level near and at distance

**Steps**

1. Prepare a lesson on reading a storybook.
2. Identify a significant number of reading difficulties.
3. Provide a baseline recording of visual acuity for near and distance.
4. Prepare an aid examination and a diagnosis of an eye disease or a refractive error.
5. Assess any changes in vision.
6. Measure the outcomes of a cataract.
7. Write a summary report and present the report in class.

8. Keep the report in your portfolio.

1. How was the task?
2. How did it help you to understand the challenges related to visual acuity and reading?
3. If you were given another chance, how differently would you do the task?

Write the procedure for carrying out visual acuity measurement at near and distance.

1. How effective was learning about visual acuity and reading?
2. What challenges did you encounter when learning about visual acuity and reading?
3. What else do I need to understand visual acuity and reading better?

There are different procedures for carrying out visual acuity measurements. The following procedure has been inspired in different ways:

(a) Have good light (natural or electric) on the chart. Ensure that the person has the best chance of seeing and reading the test chart.

(b) If the test is done outdoors, the chart should be in the light and the patient in the shade, but with light enough for seeing the patient's face during the test.

(c) Explain the procedure to the patient. The patient must be told that the test will give us information on his or her vision functions. When the patient can't see anymore, they must stop.

(d) The piece of equipment the patient touches must be clean to prevent infections from passing to others.

(e) The learner must be placed in the correct distance to the chart. Some require 3 metres and others 6 metres. Near vision charts are normally 40 cm. The learner can hold one end of a cord or rope of the measured distance to ensure that it is maintained.

(f) Each eye must be tested separately and afterwards both eyes together. If spectacles are used, the test must be taken first without the spectacles and later with them.

(g) The learner must cover one eye with a plain occlude, a card or tissue, but without pressing the eye. Pressing the eye might distort vision, when the occluded eye is being tested.

(h) Ask the learner to read from the top of the chart, and from left to right. If possible, use a LEA chart without letters.

### 4.4.2 Influence of the visual field on reading

The area that you can see at one time without moving your eyes is called the field of vision or the visual field. The visual field refers to the total area in which objects can be seen when your eyes are focused on a central point.

1. What role does the visual field play in reading?
2. What else do I need to understand how the visual field influences reading?

3. How could I understand better the role of the visual field in reading?

Dolls and eye trackers

**Activity 1**

**Time: 120 Minutes**

How to measure the visual field?

**Steps**

1. Visit a nearby school.
2. Conduct an assessment on the influence of the visual field on reading.
3. Then, write the results of the assessment.
4. Write a short report on that, then keep the rreport in your portfolio.

1. How was the task?
2. How did it help you to understand the role of the visual field in reading?
3. If you were given another chance, how differently would you do the task?

Write the procedure for assessing the role of the visual field in reading?

**Activity 2**

**Time: 80 Minutes**

Is it possible to test the visual field?

**Steps**

1. In groups of five, prepare a test to measure the visual field.
2. Test the visual field of pupils with vision disturbances.
3. Write a summary report on the result of the test and keep it your portfolio.

1. How effective was the learning?
2. What challenges did you encounter when learning about the influence of the visual field on reading?
3. What else do I need to understand better the relationship between the visual field and reading?

As a teacher, you need to know how the visual field tests are conducted. Here are some of the test:

**The confrontation test:** A quick and basic check where the examiner sits directly in front of the person being tested. The latter covers one eye and the person stares straight ahead with the other eye. The examiner's hand is moved to different positions in the field and the person being tested must tell when the hand is seen.

**The tangent screen or Goldmann:** The person being tested must sits three feet (90 cm) away from a flat, black fabric screen with a target in the centre. He must stare at the target in the centre with the uncovered eye. The examiner checks when the person being tested can see an object moving into the visual field. Usually, a pin or bead on the end of a black

stick is used and moved by the examiner. It is made a map of the central 30 degrees of the visual field of each eye. Usually, the test is used to detect brain or neurologic problems.

**Goldmann perimetry and automated perimetry:** These tests are concave domes where the person being tested stares at a target in the middle with the uncovered eye. Small flashes of light are presented in the peripheral field and the person must press a button when the flash is seen. In the Goldman, the flashes are controlled and mapped by the examiner.

In automated testing, a computer controls the flashes and mapping. Both tests are often used to track conditions that may worsen over time. The most common reasons for visual field defects are macular degeneration, glaucoma, retinitis pigmentosa, diabetes, brain injuries and neurological diseases.

### 4.4.3 The influence of different oculomotor capacities on reading

Ocular motor capacities include control and coordination of all eye movement, monocularly and binocularly. Accommodation and convergence are very important functions in reading, and it is possible to stimulate and improve upon them. Other ocular motor movements like saccades and fixations can be better during exercises. When these functions improve, they have a positive impact on school performance, especially reading.

1. What do I understand about the relationship between ocular motor capacities and reading?
2. What else do I need to understand the relationship between ocular motor capacities and reading well?
3. How could I understand the relationship between ocular motor capacities and reading better?

Cards and flip charts

**Time: 80 Minutes**

Preparation of eye movement lessons

**Steps**

1. Visit a nearby school.
2. Prepare ocular motor exercises.
3. Conduct ocular motor exercises.
4. Observe what the learners can do in relation to reading.
5. Write a short report on that, then keep the report in your portfolio.

1. How was the task?
2. How did it help you to understand the preparation of ocular motor lessons?
3. If you were given another chance, how differently would you do the task?

1. Write a short note about ocular motor capacities on reading.
2. Explain the importance of ocular motor lessons to learners?
3. Write the stages in implementing a successful ocular motor education programme.

1. How effective was the learning?
2. What challenges did you face while learning about the influence of different ocular motor capacities on reading?
3. What else do I need to understand better the influence of ocular motor capacities on reading?

Accommodation is the focusing system of the eyes. When a text is moved closer or is put far away, the accommodative system must adjust so that the words are clear. When the reading material becomes more sophisticated, with smaller letters, longer words, a larger text and less space between the lines, the accommodative system must be more precise. Disorders in the accommodative system are closely related to the convergence capacity and negatively strain the binocular system.

The movement of eyes must be precise and effective during reading so the reader gets the needed visual information from the text. The fovea must fixate on the word and both eyes must fixate exactly on the same spot. Otherwise, double vision will occur. The gaze must jump from one fixation to the next. These very fast jumps are called saccades and move the eyes from word to word in the text.

When one is reading from left to right, most saccades are directed to the right. When the reader wants to check a read word, the gaze does a regression, a saccade backward to the left. A good reader does not fixate on each letter but on words. Untrained readers have more fixations than trained ones. In addition, the *fovea* and the visual field are involved in

recognising the position of letters in the word and the words in the text line and on the page (see the vision circle). In this way, the graphemes (a combination of letters) are quickly matched with the phonemes (phonetic sounds) in the brain. Poor ocular motor control may lead to a higher number of regressions and tightly packed saccades. Specifically, binocular problems might result in letters or words being seen in wrong orders, so the text gives no meaning. A learner with poor ocular motor control may be labelled as an inattentive, careless, dyslectic, unconcentrated or distracted reader.

Whe you are looking at an object moving closer to your face, the eyes must converge towards the object. When you are looking at a distant object, the eyes must diverge. We depend on convergence for all near activities such as reading, sawing, deskwork, working on smartphone, typing devices, or even in sport when catching a ball. Convergence requires a coordination of extra ocular muscles at the same time as other muscles are relaxed.

Eye movements are probably the fastest and most frequent movements in the human body. Their control systems are complex and advanced. When we work with children, we are mainly concerned about the smooth pursuits, accommodation, saccades and vergence/convergence.

The purpose of the ocular motor system is to keep the image that is looked at on both foveae at the same time so the brain gets clear, single, and three-dimensional inputs A steady fixation is important for studying details in stationary objects. This is also the case in reading or working with mathematics. The fixations must be binocularly to get the best inputs.

## 4.5 Visual challenges in reading

Reading is the foundation of our educational system and academic learning. Reading fluently is important to succeeding at school. Vision problems can reduce learners' learning outcomes. Learners will have difficulty understanding the text and will, therefore, not be able to remember the content.

### 4.5.1 Functional vision challenges

Functional vision is more than the ability to see 20/20 (or 6/6 and 1.0). It also refers to the coordination of the eyes and how the brain deals with visual inputs. For example, a person with a functional vision problem might have 20/20 eyesight, but when they read a book, the text jumps around on the page or they have trouble keeping their place on the text line. This might be the result of reduced eye muscle control due to brain injuries or other neurological reasons. Unfortunately, some children with functional vision issues are misdiagnosed with ADHD or may be having concentration problems. ADHD and functional vision problems can both cause difficulties with concentration, reading and endurance. In addition, many functional vision problems also result in a headache, dizziness, anxiety, blurred vision, double vision and motion sickness. Because a person with a functional visual problem has difficulty in reading and writing, they often have pain in the shoulders and neck. Functional vision problems are vision issues that might evade typical vision screenings and can have a profound effect on a child, both academically and socially. Sometimes the consequences of abnormal screening results are laid down and evaluated as a functional challenge.

1. What functional vision challenges might affect the process of learning to read?
2. What do I know about the functional vision challenges that might affect the process of learning to read?

3. How could I learn more about the functional vision challenges that might affect the process of learning to read?

An eye tracker, the LEA chart, LEA symbols, a snelled chart, a ruler, an eye patch and an heid stick

**Time: 50 Minutes**

Visual challenges in reading

**Steps**

1. Sit in groups of three to five, depending on your number.
2. Each group should do one of the following tasks:
   (a) Discuss the functional vision challenges that affect the process of learning to read.
   (b) Discuss the functional vision challenges that might affect one's reading capacity.
   (c) Discuss the functional vision challenges that might result in general learning problems.
   (d) Share what you have been discussing with your colleagues for reflection.

1. How did I see the activity regarding the functional vision challenges that affect the process of learning to read?
2. Was the activity about the functional vision challenges that affect the process of learning to read helpful?
3. If you were given another chance, how differently would you do the task?

1. What is functional vision?
2. Explain the symptoms that a person with functional vision problems might have.
3. How would you help learners with functional vision challenges in reading?

1. Have I effectively learnt about the functional vision challenges that affect the process of learning to read?
2. What don't I understand well about the functional vision challenges that affect the process of learning to read?
3. What do I want to know more about the functional vision challenges that affect the process of learning to read?

In this section, you have learnt about visual challenges in reading. There are four things to consider:

(a) The functional vision challenges that might affect the process of learning to read;
(b) The functional vision challenges that affect one's reading capacity;
(c) The functional vision challenges that might result in general learning problems; and
(d) The identification of vision reading problems.

Be aware of the difference between learning to read and reading to learn. Reading to learn requires comprehension and comprehending often requires functioning visual skills. So, if the visual system is not working correctly, reading can be affected. For example, if words are blurry or double, an extra effort is required to keep the words single and clear. Disturbed visual inputs and stress have a negative impact on comprehension.

### 4.5.2 Vision reading problems

It is estimated that 1 in 4 children has a vision problem severe enough to affect their learning. However, because school screenings often only look at distant visual acuity, these problems might be overlooked. Children should be referred for a comprehensive eye examination if visual symptoms are noticed or if the expected academic level is not reached. Double vision, blurry vision, headaches, eye strain and letters appearing to move around a page are all signs of visual problems. Instead of reading fluidly and visualising the words, the learner will not get the intended message.

1. What do I know about vision reading problems?
2. What do I need to know more about vision reading problems?
3. How will I identify vision reading problems?

A Snelled chart, an Heid stick and an eye tracker

**Time: 60 Minutes**

**V**ision reading problems

**Steps**

1. Read different sources about vision reading problems.
2. Identify six vision reading problems and write them in a notebook.
3. Discuss with your colleagues the purposes of identifying vision reading problems.
4. Write short notes about the discussion; then keep them in your portfolio.

1. How was the activity?
2. How did it help you to understand visual reading problems?
3. If you were given another chance, how differently would you do the task?

1. Explain the method used in identifying visual reading problems.
2. How do you assess your learners' reading problems?

1. Have I effectively learnt about visual reading problems?
2. What don't I understand well about visual reading problems?
3. What do I need to know more about vision reading problems?

Vision and learning are closely related. Much of what is presented to children in schools is visual. A child needs clear vision to learn how to read and needs to keep his or her vision clear to continue learning in the classroom. Learners with visual reading problems have to be identified so as to treat them accordingly.

## 4.6 Viewing conditions that influence reading

In the classroom, it is important for one to have good viewing conditions. The conditions include a uniformed light in the whole room, which gives all learners usable light conditions for working on the desk and for reading what is written on the blackboard. Some classrooms need improved viewing conditions. These include things like using a good letter size on the board so that even the learners at the back of the classroom can read what is written.

Near-sighted children need to sit in the front to see the text on the board. If the board is dirty or rough, it might be difficult for them to read the text and writing on it with coloured material can give a low contrast and reduce the readability of the text. It is also necessary to evaluate the level and direction of daylight and electric light in the room and how different parts of the room are visible. If the child is faced with too much light from the window, it may be difficult for the child to read the text on the blackboard.

1. What do I know about the viewing conditions that influence reading?
2. What do I need to know more about the viewing conditions that influence reading?
3. How could I know more about the viewing conditions that influence reading?

A Lux meter, a contrast checker, a colour contrast analyser and an odometer

**Time: 60 Minutes**

Viewing conditions that influence reading

**Steps**

1. Sit in groups of three to five, depending on your number.
2. Each group should do all of the following tasks:
3. Visit different sources and read about the viewing conditions that influence reading.
4. Write down the viewing conditions that influence reading.
5. Share what you have been learning with your colleagues for reflection.

1. How was the activity?
2. How did it help you to understand the viewing conditions that influence reading?
3. If you were given another chance, how differently would you do the task?

1. Describe the methods for ensuring that there are appropriate conditions for a class.
2. Explain how viewing conditions influence reading near and at a distance in class.

1. What did I learn about different conditions that influence reading?
2. What don't I understand about the conditions that influence reading?
3. What do I need to know more about the viewing conditions that influence reading?

The teacher must know the importance of good viewing conditions in the classroom so that everyone is placed where they can see the work, read what is written on the blackboard and perceive what is presented. This includes considering the size of letters when the teacher is writing on the board, the distance where the learner is placed, contrast and choosing a piece of chalk whose colour is appropriate for the learners. In addition, you must consider the direction of the light in relation to where the child is sitting. A good classroom is one in which light is directed towards the blackboard and in which the other parts are uniformly illuminated. Teachers must observe and screen children to be aware of the development of every child, detect early signs of developmental delays or disability and

identify children who might be abused or neglected. It is necessary to recognise and note the learner's performance and behaviour and use checklists, tests and records to track the development and progress against a certain standard. In this way, there is documentation which can be discussed with parents and even with experts in the school and health system. Through learner screening, the teacher can identify and monitor normal development or possible developmental delays. A screening programme is not used for a diagnostic purpose but for understanding a learner's situation.

### 4.6.1 Detecting functional vision challenges

The normal visual acuity is 20/20 (6/6 or 1.0), which means that you see a symbol which is meant to be seen at 20 feet at such feet. However, the normal visual acuity does not say everything. There might still be ineffective eye-tracking, unsteady focusing, fixation problems, reduced convergence and accommodation capacity, reduced near visual acuity or disturbed visual attention. While these visual functions are critical for learning, it is important to check them so that the learning situation can be adapted to the learners. Vision problems related to reduced visual acuity include near-sightedness, farsightedness and astigmatism. These can be corrected with refraction and thus make reading and learning easier.

1. What do I know about the detection of functional vision challenges?
2. What do I need to know more about the detection of functional vision challenges?
3. How will I use my knowledge of detecting functional vision challenges?

A Snellen chart, a retinal camera and an eye tracker

**Time: 60 Minutes**

Detecting functional vision challenges

**Steps**

1. Sit in groups of three to five, depending on your number.
2. Each group should do one of the following tasks:
   (a) Use libraries and online materials to find ways of detecting functional vision challenges.
   (b) Discuss with your colleagues the reason for detecting functional vision challenges.
   (c) Present your work to your fellow teachers for discussion and reflection.

1. How was the activity?
2. How did it help you to understand ways of detecting functional vision challenges?
3. If you were given another chance, how differently would you do the task?

1. Explain how one could detect learners' functional vision challenges.
2. Discuss how you could help learners with functional vision challenges.
3. Did you encounter any challenges in your study of vision disturbances? What mental skills would you use to face the challenges?

1. What have I learnt about ways of detecting the functional vision challenges facing learners with vision disturbances?
2. What don't I understand well about the ways of detecting functional vision challenges among learners with vision disturbances?
3. What do I need to know more about the ways of detecting functional vision challenges among learners with vision disturbances?

In this section, you have learnt how to detect functional vision challenges in relation to sensory, motoric and perceptual difficulties by organising and responding to the information you get through observation, reflection and screening. You have also learnt about the vision challenges that affect the ability to coordinate body movements and the perceptual challenges that affect the ability of the brain to receive, interpret and act upon visual stimuli.

### 4.6.2 Observation strategies and screening tools

Observation strategies are processes of systematically viewing. A teacher might record a learner's behaviour, reactions and qualifications for the purpose of making programming decisions and providing adapted education. The observations ought to influence the entire teaching process by assisting the teacher in making the decisions required for effective teaching. Screening tools might also be important for adapting the education provided. Screening tools are simple standardised tests, structured observations, a checklist or a questionnaire. Some of the tools for screening vision are the Snellen or LEA charts for measuring distance and near visual acuity, eye cover and fixation sticks, and colour vision tests. Ophthalmologists and opticians also have retinal cameras, tonometers and others.

1. What do I know about observation strategies and tools for screening vision?
2. What more do I need to know about using observation strategies and tools for screening vision?
3. How could I know more about observation strategies and tools for screening vision functions?

Flip charts, markers, checklists, anecdotal records and running records

**Time: 60 Minutes**

1. Visit different sources and read about how important observation strategies and tools for evaluating the needs of learners with vision disturbance are.
2. Write down the observation strategies and screening tools used for screening learners with visual disturbances.
3. Share what you have been observing with your colleagues for reflection.

1. How were these activities?
2. How did they help you to understand the use of observation strategies and screening tools?
3. If you were given another chance, how differently would you do the task?

1. Explain how to use different screening tools in evaluating vision functions.
2. What is the focus of your observation?
3. Discuss the importance of doing vision screening in class.

1. What have I learnt about the observation strategies and tools used for screening learners with visual disturbances?
2. What didn't I understand concerning the observation strategies and tools used for screening learners with vision disturbances?
3. What do I need to know more about the observation strategies and tools used for screening learners with vision disturbances?.

When using observation strategies, it is important to have knowledge of vision and be curious about learners' learning. The observation acts as input for developing learning methods. For developing useful educational methods, openness towards learners and parents is an important factor. It is also important to learn from prior experiences and always to try to develop the pedagogical knowhow. Many parents are not aware of their children's vision disturbances before they are detected during a school vision screening.

The screening can show the importance of further evaluation by an ophthalmologist or optician. This examination can show the need for glasses or other appropriate services.

How does good vision help learners to deal with real-life issues at school and in the community?

## Conclusion

When we are working with learners, we are concerned about ocular motor functions like smooth pursuits, saccades, accommodation and convergence. Because the purpose of the ocular motor system is to keep the image that we are looking at on both *foveae* at the same time, it is very important for a teacher to understand the anatomy of the eye, especially the *fovea*. In Table 7 are presented some visual-related reading problems. Table 7 shows many elements that can be observed by the teacher. The teacher must ask the learner how he sees the text assigned. Some learners need medical treatment, others refraction and yet others can be helped with accommodation and convergence through structured vision exercises to improve their reading skills.

**Table 7:** Vision-related reading problems

| Vision-related reading problems | |
|---|---|
| (a) Holding books or papers too close | (b) Frequent eye-rubbing during reading |
| (c) Omitting or substituting words | (d) Using a finger when reading |
| (e) Losing a place in the text | (f) Rereading lines when reading. This often gets worse with time |
| (g) Misspelling words | (h) Not being able to copy things from the blackboard |
| (i) Avoiding reading | (j) Reading comprehension decreasing with time |
| (k) Slow reading speed | (l) Tilting or turning the head |

| Vision-related reading problems | |
|---|---|
| (m) Closing or covering one eye | (n) Red or watery eyes after reading |
| (o) Squinting or blinking during reading | (p) Crossed or drifting eyes |
| (q) Clumsy, poor depth perception | (r) Bothered by bright light |

Strengthening visual functioning improves reading. The training is provided by experts, mostly optometrists. However, teachers with special education can also give systematic vision stimulation and lessons on vision in an educational setting to children with healthy eyes.

Alimi, F. O., Tella, A., Adeyemo, G. O. & Oyeweso, M. O. (2020). Impact of Mother Tongue on Primary Pupil's Literacy and Numeracy skills in Osun state. *International Online Journalof Primary Education*, 9(2); 144-155

American Optometry Association IAOA. (2020). A Look at reading and vision. Getting at the root of reading problems. https://www.aoa.org/patients-and-public/resources-for-teachers/a-look-at-reading-and-vision

BOAS (2022). DCF behavioural observation and screening. https://quizlet.com/45530339/dcf-behavioral-observation-and-screening-boas-flash-cards/

Book Trust (2019). Getting children reading. *Conditions that affect reading and literacy.* Leeds England. https://www.booktrust.org.uk/books-and-reading/bookmark-disability-and-books/for-families-teachers-and-librarians/conditions-that-can-affect-reading/.

Galaczi, E. (2018). Benefits of testing the four skills (reading, listening, writing and speaking). English learning Assessment. *Cambridge Live*. https://www.cambridgeenglish.org/blog/benefits-of-testing-the-four-skills/

Graham, P. (2016). Poor Focus, Losing Concentration, Easily Distracted – This Can Be a Sign of a Vision Problem. Vision Problems Can Interfere with Learning but Can Go Undetected.

Harmony vision. https://www.harmonyvisioncare.com.au/poor-focus-losing-concentration-easily-distracted-this-can-be-a-sign-of-a-vision-problem

Howell, J. (2020). Dyslexia and Rudolf Berlin: Correcting the record. In *Dyslexia Commentary*. https://www.dyslexiacommentary.com/dyslexia-and-rudolf-berlin

Hulme, C. & Snowling, M. J. (2016). Reading disorders and dyslexia. *Curr Opin Pediatr*, 28(6), 731–735. Doi: 10.1097/MOP.0000000000000411

Hulyo, M. (2013). Observational Strategy. *Read.Learn. Educate*, 16. http://pupsmb.blogspot.com/2013/07/observational-strategy.html

Lane, K. (2005). *Developing Ocular Motor and Visual Perceptual Skills*. Thorofare: SLACK

Marsden, J., Stevens, S., & Ebri, A. (2014). How to measure distance visual acuity. *Community Eye Health,* 27(85), 16.https://www.ncbi.nlm.nih.gov/pmc/articles/PMC4069781/

MedlinePlus (2022). Visual Field. https://medlineplus.gov/ency/article/003879.htm

Moran, J. A. (2022). Kid's eye and vision problems: What school screenings might miss. Health University of Utah. https://healthcare.utah.edu/healthfeed/postings/2022/07/back-to-school-eye-exams.phpal-vision-problems-influence-a-childs-

Neurovisualcenter. (2022) How functional vision problem influence a child's academic progress, New York. Retrieved from: https://www.nvcofny.com/eye-care/how-function academic-progress/

Okpe, O. (2022). Accommodation. *KenHub*. https://www.kenhub.com/en/library/anatomy/acco modation

Olive, T. & Passerault, J-M. (2012). The Visuospatial Dimension of Writing. *Written Communication*, 29(3), 326–344. Doi: 10.1177/ 0741088312451111

Pokharel, P. K. (2018). *Learning to Read and Reading to Learn in English*. *Journal of NELTA Surkhet*, 5, 75-81.

Protopapas, A. & Rarrila, R. (2018). Is Dyslexia a Brain Disorder? Concept Paper. *Brain Sciences,* 8(61), 8-61. Doi:10.3390/brainsci8040061

Sandhu, R. (2022). *What is Reading? - Definition & Process. The Reading Process.* https://study.com/academy/lesson/what-is-reading-definition-process.html

Shabiralyani, G., Hasan, K. S., Hamad, N. & Iqbal, N. (2015). Impact of Visual Aids in Enhancing the Learning Process Case Research: District Dera Ghazi Khan. *Journal of Education and Practice,* 6(19), 226-233.

Sriprabha, M. (2015). A study on mother tongue influence in English communication. *Academic Research Journal*, 3(11), 296-300. Doi: 10.14662/IJELC2015.100.

Turbert, D. (2022). What is visual field testing? Six types of visual field tests. *American Academy of Ophthalmology.* https://www.aao.org/eye-health/tips-prevention/visual-field-testing

Wilhelmsen, G. B. & Knudsen, E. (2021). Reading starts as a vision process. Chapter 6 in B.

Hvidsten, I. Kyginyte-Arlauskiene, G. Söderlund (Eds), Adapted education and special needs education in theory and practice. *[Tilpasset opplæring og Spesialpedagogikk i teori og praksis*]. Fagbokforlaget.

# Unit Five

# Brain plasticity and vision

## 5.1 Introduction

Learning and new experiences can result in the strengthening of neural pathways and the development of new synapsis between brain cells and parts of the brain. Recent studies indicate that even mature brains continue to show some plasticity because of learning. Brain plasticity, also known as neuroplasticity, is the biological, chemical and physical capacity of the brain to reorganise its structure and function. This plasticity can develop more effective eye muscles as a result of structured exercises and stimulation. In this unit, you will learn about brain plasticity in vision. You will be able to explain the concept of brain plasticity, understand theories of how brain plasticity influences muscle effectiveness and with a special focus, explain how brain plasticity influences vision and education. You are therefore, expected to employ the theories of brain plasticity and muscle effectiveness to improve the vision of learners who are identified with vision disturbances in your school, thus enhancing their learning.

In this unit, you are expected to develop the following competencies:

(a) Explaining the concept of brain plasticity
(b) Analysing theories of brain plasticity and muscle effectiveness
(c) Applying the theories of brain plasticity in vision and education

**Time:40 Minutes**

In groups of five, do the following:

1. Conduct a library search on brain plasticity.
2. Examine the theories of brain plasticity and muscle effectiveness.
3. Discuss how brain plasticity might influence vision and education.
4. Share your findings with your fellows.
5. Keep the findings in your portfolio.

1. How was the task?
2. How did it help you to understand the concept of brain plasticity and muscle effectiveness?
3. How could you apply the theories of brain plasticity and muscle effectiveness in vision and education in your class?
4. If you were given another chance, how differently would you do the task?

## 5.2 The concept of brain plasticity and muscle effectiveness

The nervous system needs to rearrange itself all the time so that it adapts to all unfolding situations. The genes are programmed in such a way that they give human beings as well as animals neuroplasticity to change attitudes and reactions so they can adapt and survive in changeable environments. Neuroplasticity, also called brain plasticity, refers to the capacity of the brain to change and adapt in structure and function to respond to learning and experience. Brain processes allow the brain to rewire itself and cause changes, which range from individual neuron pathways, making new connections to systematic adjustments like cortical remapping. Exercises support brain plasticity and muscle effectiveness by stimulating the growth of new connections between cells in many important cortical areas of the brain.

Research has demonstrated that targeted and structured exercises increase the number of growth factors in the brain, which makes it easy for the brain to grow new neuronal connections.

A muscle is a bundle of fibrous tissues in a human or animal body that has the ability and physical strength to contract, produce movements or maintain the position of a specific body part. The goal is to develop effective muscles capable of producing a desired result, including flexibility, strength and the ability to stay in power over time. Muscles are important for movement and interaction with the world. They help humans and animals to see, hear and move. Others are responsible for breathing or food digestion. Muscle effectiveness is a consequence of age growth. Exercise and a healthy diet help muscles to function.

1. What is my current understanding of the concept of brain plasticity?
2. What else do I want to learn about the concept of brain plasticity and muscle effectiveness?
3. What strategies should I use to understand better brain plasticity and muscle effectiveness?

Online resources, journal articles, books as well as various text on brain plasticity and muscle effectiveness

**Time: 90 Minutes**

1. Use the library and other search engines to read about the concept of brain plasticity.
2. Write a report and put it in your portfolio.

1. How was the task?
2. How did it help you to understand the concept of brain plasticity?
3. If you were given another chance, how differently would you do the task?

1. How would you use the knowledge gained to explain the concept of brain plasticity in relation to the vision and education of learners?
2. What challenges did you encounter in explaining the concept of brain plasticity?
3. How did you overcome the challenges?

1. How effective was the learning?
2. What challenges did you meet when learning about brain plasticity and muscle effectiveness?
3. What else do I need to understand brain plasticity better?

There are several forms of brain plasticity that remain largely functional in the learner's visual system. Below are at least four major forms of functional neuroplasticity that can be studied in normal human subjects and patients. The four forms of functional neuroplasticity are:

(a) Homologous area adaptation: The assumption of a particular cognitive process by a homologous region in the opposite hemisphere.

(b) Cross-modal reassignment: This occurs when structures previously devoted to processing a particular kind of sensory input now accept inputs from a new sensory modality.

(c) Map expansion: The enlargement of a functional region in the brain on the basis of performance.

(d) Compensatory masquerade: This is a novel allocation of a particular cognitive process to perform a task.

These four forms of functional neuroplasticity answer several fundamental questions about how functional cooperation between regions of the brain is achieved and can be addressed. However, while brain plasticity occurs throughout life, certain changes occur at specific ages. The brain changes during the early years of life as an immature brain grows and organises itself. Young brains tend to be more sensitive and responsive to experiences than older ones. To accomodate this in the learning environment teachers need adequate knowledge of brain plasticity so that they can create an interactive learning environment in relation to learners' vision.

## 5.3 Theories of brain plasticity and muscle effectiveness

The beliefs and theories about how the brain works are controversial. Early researchers believed that the brain was "fixed," while modern advances have shown that the brain is more flexible. This is well explained in early and modern theories. However, brain plasticity and muscle effectiveness can be well explained with reference to the factors for the plasticity of the brain. They are cognitive, environmental and genetic factors. The plasticity of the brain has a direct impact on the effectiveness of eye muscles. The vision of learners is impacted positively when their eye muscles are active and flexible to perceive and interpret visual stimuli in the learning process. Being conversant with these theories enables you, as a teacher, to improve upon your teaching and learning activities so as to enhance brain plasticity in your learners.

1. What is my current understanding of the theories of brain plasticity?
2. What else do I need to learn about brain plasticity?
3. What strategies should I use to better understand the theories of brain plasticity?

Tablets, computers, mobile phones, journal articles and books

**Time: 60 Minutes**

1. Do a library search about theories of brain plasticity and muscle effectiveness.
2. Share your findings with your fellows.
3. Accommodate comments from your fellows.
4. Write a report and file it in your portfolio.

1. How was the task?
2. How did it help you understand the theories of brain plasticity and how could they be employed in vision and education?
3. If you were given another chance, how differently would you do the task?

1. Describe the assumptions of brain plasticity theories in relation to eye muscle effectiveness.
2. How would you apply brain plasticity theories in stimulating vision for muscle effectiveness in education?

1. How effective was the learning?
2. What challenges did you meet while learning about brain plasticity theories?
3. What else do I need to understand brain plasticity and muscle effectiveness better?

In the 20th century, researchers believed that changes in the brain could only take place during infancy and childhood. By early adulthood, it was believed that the brain's physical structure was mostly permanent. However, 21st century researchers have found evidence that shows that the brain is able to rewire itself after being damaged. Modern research has demonstrated that the brain continues to create new neural pathways and alter existing ones to adapt to new experiences, learn new information and create new memories. This is especially important for vision teachers; they need brain plasticity theories in stimulating vision in an academic setting.

## 5.4 Brain plasticity in vision and education

The visual system is not fully developed at birth. Over the first two years of a child's life, visual experiences shape the neural architecture of the visual system. During the first four months, eye teaming begins to develop with eye-hand coordination. By eight months, depth perception is developing. By 12 months, these skills are very strong and continue to improve. During these early months and years, an abnormal visual status inhibits the normal development of the visual system. Amblyopia, strabismus or eye disease can significantly impact the child's visual skills. Children, fortunately, have a highly plastic visual system; thus, amblyopia, strabismus and other disorders of binocular vision can often be corrected with good success, if detected and treated early. Adults, however, have a less plastic visual system and need more time and effort to overcome an abnormal visual experience in childhood. With respect

to vision, many of the tasks aimed at enhancing the plasticity of the visual system rely on the components of perceptual learning. Perceptual learning is a broad term that requires repetition of a task to improve on a certain skill. Perceptual learning may be used in accommodation training, binocular tasks or monocular tasks. Vision therapy is an example of how neuroplasticity is used to help enhance vision functions. Structured vision lessons and stimulation at school have been shown to be successful with children. Such activities may also improve visual perceptual skills and visual attention.

1. What is my current understanding of the application of brain plasticity theories to vision and education?
2. What else do I need to learn about brain plasticity theories in relation to vision and education?
3. What strategies should I use to understand better brain plasticity theories in relation to vision and education?

Computers, tablets, laptops, journals, articles, books and mobile phones

**Time: 60 Minutes**

Watch a video clip about the brain plasticity of a child at the age of six and answer the following questions:

1. What are the benefits of brain plasticity to vision and education?
2. How would you apply brain plasticity in vision and education?
3. Write a summary on the video clip you have watched.

1. How was the task?
2. How did it help you to understand the role of brain plasticity in vision and education?
3. If you were given another chance, how differently would you do the task?

1. What challenges are you likely to encounter when using the theories of brain plasticity in vision and education?
2. How will you overcome the challenges?
3. Compare the theories of brain plasticity of the 20th century with those of the 21st century.

1. How effective was the learning?
2. What challenges did you face while trying to understanding brain plasticity and vision in education?
3. What else do I need to know about brain plasticity in vision and education?

In order to support the development of vision in children, it is important to do various activities to allow development of brain plasticity. Children need an environment and activities which stimulate their senses, including their visual sense from an early age. The visual capacity is often taken for granted, although it develops through childhood and even when one is in primary school. Children should be engaged in visual activities together with their caretakers and teachers from an early age. Words should accompany objects and pictures. When pointing at pictures shifting from close to far, the child is training its accommodation and convergence, steady fixation, saccades (the gaze jumps from one position to the next) and

eye-hand coordination. Such activities stimulate many parts of the brain.

1. What new information have you learnt which you would like to apply in your classroom activities in future?
2. What else do you want to learn about activities that allow the plasticity of the brain to develop in children? Why?

## Conclusion

Vision develops through childhood. Parents can help their children to develop their vision through a number of simple activities that could be incorporated into their daily life. By recognising important milestones in vision development and brain plasticity, parents, teachers and other caregivers can easily identify warning signs of potential vision deficits. They can also support optimal early vision development by creating an environment at home and at school which facilitates growth of the plasticity of the brain and muscle effectiveness.

Armstrong, B. (2018). How exercise affects your brain. https://www.scientificamerican.com/article/how-exercise-affects-your-brain/

Bruel-Jungerman, E., Davis, S., & Laroche, S. (2007). Brain Plasticity Mechanisms and Memory: A Party of Four. *The Neuroscientist, 13*(5), 492–505. Doi:10.1177/1073858407302725

Cioni, G., D'Acunto, G., & Guzzetta, A. (2011). Perinatal brain damage in children neuroplasticity, early intervention, and molecular mechanisms of recovery *Progress in Brain Research, 189;* 139–154. Doi: 10.1016/b978-0-444-53884-0.00022-1

Cherry, K. (2022). What is neuroplasticity? https://www.verywellmind.com/what-is-brain- plasticity-2794886

Cleveland Clinic. (2022). Types of muscles, Functions & Common conditions, Ohio. https://my.clevelandclinic.org/health/body/21887-muscle

Fuchs, E., & Flügge, G. (2014). Adult Neuroplasticity: More Than 40 Years of Research. *Neural Plasticity, 2014*, 1–10. https://doi.org/10.1155/2014/541870

Gamma, E. (2021, March 24). *What is brain plasticity*. Simply Psychology.www.simplypsychology.org/brain-plasticity.html

Grafman, J. (2000). Conceptualizing functional neuroplasticity. *Journal of Communication Disorders,* 33(4), 345-356. Doi:10.1016/S0021-9924(00)00030-7

Grafman, J., & Litvan, I. (2022). Evidence for four forms of neuroplasticity, switzerland. https://link.springer.com/cha ter/10.1007/978-3-642 59897-5_9

Vivid Vision (2022). Vision Therapy for adults. https://cn.seevividly.com/info/lazy_eye_treatments/Vision_therapy/vision_therapy_for_adults

Wilhelmsen, G., Felder, M. (2020). Learning is visual: Why teachers need to know about vision. *intechopen.* https://www.intechopen.com/online-first/learning-is-visual-why- teachers-need-to-know-about-vision Interesting further reading:

**More literature to the thematic:**

Kolb, B., & Gibb, R. (2011). Brain plasticity and behaviour in the developing brain. *Journal of the Canadian Academy of Child and Adolescent Psychiatry,* 20(4), 265.

Ortiz, T., Perez, D. L., Aragón, J. I., Costumero, V., & Sepulcre, J. (2017). Brain circuit–gene expression relationships and neuroplasticity of multisensory cortices in blind children. *Proceedings of the National Academy of Sciences*, 114(26), 6830-6835.

Rowland, D. (2010). The brain that changes itself: Stories of personal triumph from the frontiers of brain science. *Journal of Academic Language and Learning,* 4(1), B1-B3.

Sebastianelli, L., Saltuari, L., & Nardone, R. (2017). How the brain can rewire itself after an injury: the lesson from hemispherectomy. *Neural regeneration research*, 12(9), 1426.

# Unit Six

# Vision stimulation

## 6.1 Introduction

Children's development involves and grows on constructive inputs, stimulation and experiences. This is also the case for their visual attention, perception and ocular motor functions. These skills are important for children's cognitive functions learning and reading. Researchers from different disciplines have developed theories of how to stimulate and train specific sensory and ocular motor functions. The researchers found that vision stimulation is important to all children. Neurological pathways are formed and strengthened through experiences and the repetition of actions. The pathways may improve even after puberty because substantial neural plasticity remains throughout life. Vision maturation is obtained by the visual stimuli available in the environment in which the child lives. It is important that teachers, parents and caregivers provide a stimulating environment to support the visual development of children.

In this unit, you will learn about vision stimulation for learners with vision disturbances. You will learn to analyse the methods and tools for vision stimulation and structured learning for learners with reading challenges and even for pre-school children. It is expected that, after completing this unit, you will be able to help build good vision among children and learners by creating a good stimulating environment.

In this unit, you are expected to develop the following competencies:

(a) Applying methods and tools for stimulating the vision of pre-school age children; and

(b) Analysing vision stimulation and structured learning for learners with reading challenges.

**Time: 20 Minutes**

On the basis of your teaching experience and from various sources, work on the following questions:

1. What is children's vision development?
2. What is stimulation of the vision of pre-school age children?
3. How would you stimulate the vision of learners with reading challenges?

1. How was the task?
2. How did it help you to understand stimulation of the vision of pre-school age children?
3. If you were given another chance, how differently would you do the task?

## 6.2 Stimulation of the vision of pre-school age children

At birth, the nerve cells in a baby's brain are disorganised and not well connected. As the baby grows, the brain receives input from all the senses (vision, smell, taste, touch, hearing and others). The input causes the nerve cells to multiply and form a multitude of connections with other nerve cells and thus, visual stimulation is very important. For example, if a baby is blindfolded the visual centre in the brain will never develop, the optic nerve will shrivel up and the baby will never develop vision. This shows how important vision development is to the development of the retina, the optic nerve and the visual part of the brain. Even a healthy nutrition can influence vision development positively.

1. What is my current understanding of stimulation of the vision of pre-school age children?
2. What else do I need to learn about stimulation of the vision of pre-school age children?
3. What strategies should I use to understand well stimulation of the vision of pre-school age children?

Coloured materials, toys, sample games, real objects, books, journal articles, picture books, drawing and colouring books, Heidy's stick, toys, balls/tennis, stickers/posters, cards, dominos and local games such as *mdako* and *butua*

**Time: 60 Minutes**

1. Use different tools and methods to demonstrate how to stimulate the vision of pre-school age children.
2. Design a programme that will help parents and caregivers on the importance of stimulating the vision of pre-school age children.

1. How was the task?
2. How did it help you to develop methods for stimulating the vision of young children?
3. How would you advise parents and caregivers on the importance of stimulating the vision of pre-school age children?

1. "While the baby's vision may be one of the least developed senses at birth, visual inputs during the early months have a profound effect on the development of the baby's nervous system" Explain what this statement means.
2. Why is it that visual stimulation very important to pre-school age children?
3. Briefly explain how to stimulate a child s' visual senses?

1. How effective was the learning?
2. Which aspects of stimulating the vision of pre-school age children need more clarification?
3. What else do I need to know about stimulation of the vision of pre-school age children?

Children's vision develops in many years. Children are not born with all the visual abilities they need in life. The ability to accommodate, move the two eyes and use them together must be learnt. Children also need to learn how to use the visual information the eyes send to their brain to understand the world around them and interact with it. From birth, babies begin exploring the wonders in the world with their eyes. Even before they learn to reach and grab with their hands or crawl and sit up, their eyes provide information and stimulation important for their motor development, their social interaction and their understanding of words. Thus, children must have well-developed visual skills in order for them to learn to read, write and many other motor activities.

## 6.3 Vision stimulation and structured learning for learners with reading challenges

Learners' eyes are coordinated with each other to reach single images. If there are any challenges in vision or double vision, learners can find it difficult to read and comprehend written information. Children with a vision-related learning problem will typically lose their place while reading, see letters in the word in wrong positions and are confused when looking at similar letters/ words because they cannot properly see the text. Because of this, children with poor vision often show signs of poor reading comprehension and may struggle to keep up with class assignments.

1. What is my current understanding of vision stimulation and structured learning for learners with reading challenges?
2. What else do I need to learn about vision stimulation and structured learning for learners with reading challenges?
3. What strategies should I use to understand well vision stimulation and structured learning for learners with reading challenges?

Coloured materials, toys, real objects, books, journal articles, eye patches, pencil dolls, letter cards, reading books, picture books, drawing and colouring books, book chapters, needles and threads

**Time: 180 Minutes**

Undertake a vision-stimulation activity for learners with reading challenges through a structured learning programme in a nearby school.

**Steps**

1. Prepare a scheduled activity for vision lessons for learners with reading challenges.
2. Prepare tools for stimulating the vision of learners with reading challenges.
3. Test the tools.
4. Stimulate the vision of learners with reading challenges.
5. Observe and record the behaviour of the children's vision throughout the activity.
6. Write a report and put it in your portfolio.

1. How was the task?
2. How did it help you in developing learners' reading skills?
3. How would you advise parents and caregivers on the importance of stimulating the vision of learners with reading challenges?

How would you stimulate the vision of learners with reading challenges?

1. How effective was the learning?
2. Which aspects of vision stimulation for learners with reading challenges need more clarification?
3. What else do I need to know about stimulation of the vision of learners with reading challenges?

As a teacher, you must remember that problems with visual functioning can have damaging effects on the overall development of a child, if they are not discovered and attended to early. The challenges related to vision do not need to be severe or at the level of a medical classification of visual impairment to impact education such as reading and writing. Some problems may not be solved with eyeglasses alone or at all. For some visual conditions, structured vision exercises might be required to improve. Vision problems in infants can cause developmental delays. It is therefore, important to detect any problems early so that babies can develop the visual abilities they need to grow and learn. Parents play an important role in assuring that their children's eyes and vision develop properly.

1. What new information have you learnt which you would like to apply in your classroom in future?
2. What else do you need to learn about vision stimulation of pre-school age children, learners with intellectual impairment and learners with reading challenges?
3. Which activities and tools do you think are more appropriate for stimulating the vision of pre-school age children, learners with intellectual impairment and learners with reading challenges.

## Conclusion

To support stimulation of the vision of pre-school age children and learners with reading challenges, teachers and parents should encourage the children to "look" at objects in their environment so they become aware of their surroundings. They include natural and man-made objects such as flowers, plants, animals, colours and shapes. Teachers, parents and other caregivers

should have conversations with children about what they see and stimulate their visual perception, visual discrimination and visual memory in different ways through games and structured exercises with a variety of age-appropriate material. Specifically, pre-school age children may need many activities that stimulate and support the visual system. Puzzles, memory games and building with blocks with and without models can provide a good foundation for visual development. Children should do activities that stimulate their near and distant vision.

Alrasheed SH, Naidoo KS, Clarke-Farr, PC. (2016). Childhood eye care services in South Darfur state of Sudan: Learner and parent persective, *AfrVis Eye Health*; 75 (1) 1-13.

Barraga, N. (1964). *Increased Visual Behaviour in Low Vision Children*. Research Series, no 13, New York, NY: American Foundation for the Blind.

Björklund, D. F., & Causey, K. B. (2017). *Children's thinking: cognitive development and individual differences* (6th ed.). SAGE.

Brémond-Gignac, D., Copin, H., Lapillonne, A., & Milazzo, S. (2011). Visual development in infants: Physiological and pathological mechanisms. *Current opinion in ophthalmology,* 22, 1-58.

Coetzee, D., & Pienaar, A. E. (2013). The Effect of Visual Therapy on the ocular motor control of seven-to eight-year-old children with developmental coordination Disorder (DCD). *Research in Developmental Disabilities, 34, 4073 4084*. Doi: 10.1016/j.ridd.2013.08.036

Dehaene-Lambertz, G., & Spelke, E. S. (2015). The infancy of the human brain. *Neuron*, 88(1), 93-109.

Halunen, K., & Latvala, O. M. (2021). Review of the use of human senses and capabilities in cryptography. *Computer Science Review*, 39, 100340.

Leibovitz, Z., Lerman-Sagie, T., & Haddad, L. (2022). Fetal brain development: Regulating processes and related malformations. *Life,* 12(6), 809.

Lillard, A. S. & Erisir, A. (2011). Old dogs learning new tricks: Neuroplasticity beyond the juvenile period. *Developmental Review,* 31(4), 207-239. Doi: 10.1016/j.dr.2011.07.008.

McGrath, E. L., Gao, J., & Wu, P. (2018). Proliferation and differentiation of human fetal brain neural stem cells in vitro. *Journal of Neurorestoratology*, 6(1), 8.

Schiller, D., et al. (2010). Preventing the return of fear in humans using reconsolidation update Mechanisms. Nature 463, 49–53. Doi: 10.1038/nature08637

Wilhelmsen, G. B., & Felder, M. (2021). Structured visual learning and stimulation in school: An intervention study. *Creative Education*, *12*(4), 757-779.

Wilhelmsen, G. B., Aanstad, M. L., & Leirvik, E. I. B. (2015). Implementing Vision Research in Zimmermann, A., Carvalho, K. M. M. D., Atihe, C., Zimmermann, S. M. V., & Ribeiro, V. L. D. M. (2019). Visual development in children aged 0 to 6 years. Arquivos brasileiros de oftalmologia, 82, 173-175. Special Needs Education. *Support for Learnin*g, 30, 134-149. Doi: 10.1111/1467-9604.12083

Felder, M., Wilhelmsen, G., & Schneiders, K. (2021). Developing "Vision-for-Learning" Competencies among Teachers in Tanzania — An Innovative Higher Education Initiative.*Creative Education*, 12, 82-102. https://doi.org/10.4236/ce.2021.121007

Lane, K. (2005). *Developing Ocular Motor and Visual Perceptual Skills.* Thorofare: SLACK

Santos, A. N. (2021). Home-based early stimulation program targeting visual and motor functions for preterm infants with delayed tracking: Feasibility of a Randomized Clinical Trial. *Research in Developmental Disabilities*, 116, 104037.

Hvidsten, I. Kuginyte-Arlauskiene, & G. Söderlund (Eds), Adapted Training and Special Needs Education in Theory and Practice [*Tilpasset Opplæring og Spesialpedagogikk iteori og praksis*]. Bergen: Fagbokforlaget.

Wilhelmsen, G. B., & Felder, M. (2020). Learning is visual: Why teachers need to know about vision. *In School Management in the 21st Century*. IntechOpen. https://www.intechopen.com/chapters/73159

# Unit Seven

## Measures for preventing vision disturbances

### 7.1 Introduction

In any educational setting, learners need to be provided with an appropriated and conducive environment which facilitates their learning. Learners' vision enables them to receive visual information from the environment which is sent to the brain for interpretation. Therefore, it is important for teachers to be equipped with preventive methods and measures to protect and improve learners' vision so that learning can take place. To support learning, the environment must have the least restrictive features, the viewing conditions must be good and the environment should not be overcrowded. It must be accessible to all learners, regardless of their vision conditions. A classroom and other kinds of physical infrastructure must be set in keeping with learning and teaching standards so that every learner is accommodated.

In this unit, you will learn about methods and measures for preventing vision disturbances. You will also learn how to prepare learners for reading and use of chalk/board effectively. In addition, you will learn about the methods of identifying learners who need proper placement in a school settings and you will learn how to observe learners with visual challenges in reading. You are expected to be able to use different methods and measures for developing vision perception to facilitate learning in school settings.

In this unit, you are expected to develop the following competencies:

(a) Preparing learners for reading
(b) Using writing boards effectively
(c) Identifying learners with visual challanges in order to place them properly

(d) Analysing methods of developing learners'vision perception

**Time:40 Minutes**

1. What methods or approaches do you normally use in your class to prepare learners for reading?
2. How do you use and write on the board?
3. What methods do you use to develop the vision perception of learners in your class?
4. How do you identify learners with visual challenges in reading?

1. How was the task?
2. How did it help you to understand methods and measures for preventing vision disturbances among learners in you class?
3. If you were given another chance, how differently would you do the task?

## 7.2 Developing learners' reading skills

In Tanzania, many children have challenges in mastering reading skills, even after spending several years in school. One of the causes of failure in children's learning to read is disturbed vision. Intact visual capacity is important in print reading, reading things written on the blackboard as well as learning in general. However, teachers in countries without a mandatory vision screening programme have little knowledge of learners' visual needs. Nonetheless, teachers can be effective vision screeners and can adopt ideally vision-guided educational practices to improve children's reading and learning.

In recent years, vision screening programmes have been established in schools in over 20 states in the US. The reason for involving schools in vision care

delivery is the connection between vision and education, and the fact that poor vision has a serious impact on learning. Therefore, consider the consequences of poor vision for pupils in disadvantaged communities as critical.

Therefore, learners need to develop reading skills before beginning formal schooling. After children have started schooling, teachers must prepare the learners for formal learning by assigning them reading activities to do. Learners' reading ability is influenced by their vision. Good vision is an important precondition for developing a satisfactory reading capacity for learning. Teachers should screen learners' vision before teaching and through the years when they are at school. The results of vision screening indicate the need for individual measures like another placement in class, another teaching methodology, extra visual stimulation or a follow-up by a health expert.

1. What is my current understanding of the preparation of learners for reading?
2. What else do I need to learn about the preparation of learners for reading?
3. What strategies should I use to understand well the preparation of learners for reading?

Flip charts, marker pens, different texts about the preparation of learners for reading, audio-visual materials, sample games and songs, pictures and real objects

**Time : 80 Minutes**

Describe the preparation of learners for developing reading skills

**Steps**

1. Sit in groups of three to five and do the following tasks:

(a) With vivid examples, analyse features of the preparation of learners for reading in a classroom setting.
(b) Share with your friends the way in which you prepare your learners for reading.
(c) Explain how you help the learners identified with vision disturbances to improve their vision for better reading.

2. Take the responses from your fellows and present them in class for discussion.
3. Incorporate their contributions and put the answers in your portfolio.

1. How was the task?
2. How did it help you to understand the preparation of learners for reading?
3. If you were given another chance, how differently would you do the task?

1. What are the main assumptions in the preparation of learners for reading?
2. Explain the main features to consider in preparing learners for reading.
3. Elaborate the preparation of learners for reading in Tanzania.

1. How effective was the learning?
2. What challenges did you face when learning to prepare learners for reading?
3. What else do I need to understand well the preparation of learners for reading?

Learning to read is a process with two main phases. The first important activity is to learn the sounds related to the visual forms of each letter and how to combine sounds and forms into words. During the second phase, the child can understand the meaning of texts and read for learning.

Reading is the main activity in education and is one of the most important and basic skills learnt at school. Although vision functions are essential in reading, the activity is mostly seen as a phonetic and semantic process in which the influence of vision on reading has been given little attention. The fact is that all brain-related processes relating to reading are built on vision inputs and a visual analysis of printed texts. When visual inputs mislead the phonetic and semantic processes, the reading process will be confusing. Very often, visual problems are caused by weak accommodation and convergence or other binocular functions.

Some of the requirements relate to vision inputs, namely letters, signs and words. These must be seen clearly so that all the tiny details that distinguish one form from another are seen.
This requires a good near VA. The letters must also be perceived as single letters, and not as double letters. They appear in the right order. If this is not the case, the learners may have eye muscle disorders. It is essential that the visual reading techniques develop into an effective reading strategy so that the learner does not use much energy to perceive the content of the text.

## 7.3 Using writing boards for learning

The tool that is mostly used in an educational setting is the blackboard. Writing boards are a free-form medium where the teacher must make a structure and

form of the presentation. They can be used to address a variety of teaching methods during the teaching and learning process.

The way in which teachers use writing boards is mostly limited by their creativity. Since writing is an art, the use of writing boards also needs certain skills. Some teachers have bad handwriting, which is a challenge in writing well on the board. Teachers must make sure that they keep the board neat and well-spaced so that the learners can easily see and read what is written on it. While writing, teachers must keep their writing neat and use large letters for the learners at the back of the classroom to see them. They should leave some space around the actual writing or drawing. It is not advisable to use too many colours as they can distract and confuse learners. Use colours to draw attention to something you want your learners to focus on. Remember that the colours of certain pieces of chalk have a poor contrast with the colour of the blackboard and might affect the visibility of the text. All writing boards ought to be lighted so the contrast between text and the background is maximised.

1. What is my current understanding of how to use writing boards?
2. What else do I need to learn about the use of writing boards?
3. What strategies should I use to understand well the use of writing boards?

Flip charts, markers, different texts about using writing boards, pictures and real objects such as whiteboards, blackboards, computer and projector

**Time : 60 Minutes**

Training in the use of writing boards

**Steps**

1. Go to the library or online library to read about how to use writing boards in teaching.
2. Choose appropriate techniques which you might use when writing on the chalkboard.
3. Evaluate the techniques you have chosen.
4. Conduct several training sessions about writing on the white/chalkboard.
5. Assess the use of writing boards in Tanzanian schools in relation to infrastructure and facilities, classroom size, the number of students and the nature of learners.
6. Share results with your fellow teachers for reflection.
7. File what you have been learning in your portfolio.

1. What is my current understanding of how to use writing boards?
2. What else do I need to learn about the use of writing boards?
3. What strategies should I use to understand well the use of writing boards?

Flip charts, markers, different texts about using writing boards, pictures and real objects such as whiteboards and chalkboards

**Time : 60 Minutes**

Training in the use of writing boards

**Steps**

1. Go to the library or online library to read about how to use the writing boards in teaching.
2. Choose appropriate techniques which you might use when writing on the chalkboard.
3. Evaluate the techniques you have chosen.
4. Conduct several training sessions about writing on the white/chalkboard.
5. Assess the use of writing boards in Tanzanian schools in relation to infrastructure and facilities, classroom size, the number of students and the nature of learners.
6. Share with your fellow teachers for reflection.
7. File them in your portfolio.

1. How was the task?
2. How did it help you to understand proper use of writing boards or computer?
3. If you were given another chance, how differently would you do the task?

1. What are the main assumptions in the use of writing boards or computer?
2. Explain the main things to consider in using writing boards or computer.
3. Elaborate the use of writing boards in schools in Tanzania.

1. How effective was the learning?
2. What didn't go well as you learnt how to use writing boards?
3. What else do I need to understand well the use of writing boards?

Using writing boards and computers in teaching learners is important. The boards may be white, black or in a different colour. Diagrams, notes, calculations and exercises are written on them. The handwriting and information written on the boards must be clear and readable. There must be enough space between letters, clear forms and enough distinction between words and sentences. Everything written on such boards must be seen even at the back of the room. As well as the alignment of writings, the main points must be highlighted, the space must be utilised well and the content must be correct and summarised well. Teachers must stand at an angle of 45 degrees from the board so that what they write on the board is visible.

They must repeatedly keep on learners during the writing session so that learners with disturbed vision can easily be identified and get helped to see the written content.

## 7.4 Identification of learners for proper placement

In education, placement refers to the act of matching students with the appropriate educational programme or environment for their age, abilities and needs. Other things may also be taken into account. These are standardised tests, classroom tests, interviews and past student performance. This placement must also consider the visual needs of the learner. Some learners need a specific placement because of their vision disturbances. However, before they are properly placed, they need to be identified through assessment of their vision. The identification might begin with observations during teaching and

the learning process when teachers pay attention to the interaction of learners in the classroom. Objective screening of distant and near VA is important for understanding learners' challenges. Talking to the learner and asking about the appearance of the text, if it changes after a while, if letters are jumping or turning foggy or if they have a headache or tearing, after reading is important. Information about the learner's experience with the light conditions is used by the teacher to give the learner the right place to sit in the classroom.

1. What is my current understanding of how to identify learners for proper placement?
2. What else do I need to learn about identification of learners for proper placement?
3. What strategies should I use to understand well the identification of learners for proper placement?

Flip charts, marker pens, different texts about using writing boards, pictures and real objects such as whiteboards, projector, computer and chalkboards

**Time: 50 Minutes**

Improving skills for identifying learners for proper placement

**Case Study**

*Read the following passage and answer the questions that follow.*

Ms Nshella is a Social Studies teacher at Kifunzo Primary School. She teaches Standard Seven pupils. One day, she taught her pupils about the solar system and the universe. As she was introducing the lesson, she drew the solar system on the blackboard and asked the learners some questions.

The learners actively responded to the questions. She asked them to stand up (one after another) and name the planetary objects she pointed at. Most of the learners named them correctly and were very interested in the exercise. However, one learner could not name the planetary objects. The teacher pointed at another planet; the learner could not name it. This disappointed Ms Nshella. She said to herself, "I expected my lerners to easily name the planetary objects as they have been studying the topic since they were in Standard Three. What's wrong?" she wondered. "Is he afraid of me or doesn't he understand what I am teaching?" She changed the question and asked the learners to mention the eight planets according to their arrangement. All the learners named the planets. Ms Nshella asked the learner, "Why can't you name the planet I am pointing at, if you can mention all the planets?" Ms Ilakoze directed the pointer to different planets several times, but the pupil could not name them. The teacher left him and asked another learner to name the planet. There were at least five learners who could not name the planets chronologically. This made Ms Ilakoze furious and angry. She told the five pupils to see her in the office soon after the lesson.

1. What might be the challenges facing the pupils who could not name the planetary objects?
2. What made Ms Nshella realise that some of her pupils could not name the planetary objects?
3. What might have caused the learners' failure to name the planets?
4. Mention other strategies that Ms Nshella should have used to identify the learners with such challenges.
5. How would you identify learners with vision challenges in your class?

6. Do other learners face similar challenges in naming things written on the board?
7. What kind of notes or things are your learners comfortable with when they are written or presented on the board? Or how should notes and other written information be presented on the board so that all your learners can see or red them?

1. How was the task?
2. How did it help you to understand how learners in need of proper placement can be identified?
3. If you were given another chance, how differently would you do the task?

1. What are the main assumptions in the identification of learners who need proper placement?
2. Explain the main things that one needs to consider when identifying learners who need proper placement?
3. Identify strategies for identifying learners who are in need of proper placement in Tanzania.

1. How effective was the learning?
2. What challenges did you face when learning to identify learners who need proper placement?
3. What else do I need know about the identification of learners who need proper placement?

Sometimes vision problems develop over time, or they are so minor that they continue for a long time without being noticed. The learner himself is often the last person to recognise or report a disturbance in vision, unless it has worsened. Most learners think that they see things in the same way as everybody else. If the vision challenge remains undetected, it can result in serious learning problems. The distraction of vision can have a negative effect on students' academic, communication and social development, and thus preventing them from realising their full potential. Vision problems can have permanent consequences, which may have a serious influence on the quality of life. Therefore, teachers must be aware of the behaviour of these learners. Some of the learners with vision problems might be complaining that the light in the classroom is too bright or that they have difficulty copying the text correctly from the board. Some even bump onto things in the room. While moving about, teachers need to be aware of the indicators so that they can help their students read, write and manage the subjects.

To identify learners with vision disturbances, teachers need to observe their eyes and look at how they use them. How do the eyes look? Do the learners complain during visual work at near?

Are the eyes moving together? How good is eye-hand coordination? Are the learners able to compare visual forms? Do they see everything that is near, not things that are far away? Are they tilting their heads during reading? Teachers need to know that learners with vision disturbances might show one or more of the signs mentioned here and in Table 8.

**Table 8:** Some of the observed signs of disturbed vision

| Signs of disturbed vision | |
|---|---|
| One eye turns in or out at any time | Reddened eyes or lids |
| Eyes tear excessively | Encrusted eyelids |
| Headaches in the forehead or temples | Burning or itching eyes after reading or working at a desk |
| Nausea or dizziness | Prints blurred after reading for a short time |
| Squinting | Closing or covering one eye |
| Turning the head when one is reading across the page | Complaining of seeing double images (diplopia) |
| Tilting the head much while one is working at a desk | Showing gross postural deviations during all desk activities |
| Repeatedly confusing left-right directions | |

As a teacher, you must be aware of your learners' reading performance and find out whether their challenges might indicate vision problems. Table 9 contains some of the signs of vision-related problems with reading and writting

**Table 9:** Some of the signs of vision-related problems with reading and writing

| Vision-related problems with reading and writing | |
|---|---|
| Losing the place often during reading | Using a finger to keep the place in the text |
| Having a short attention span in reading or copying | Frequently omitting words |
| Repeatedly omitting "small" words | Writing up or down on paper |

| Vision-related problems with reading and writing | |
|---|---|
| Rereading or skipping lines unknowingly | Orienting drawings poorly on a page |
| Repeating letters within words | Omitting letters, numbers or phrases |
| Misaligning digits in number columns | Lacking orientation, placement of words or drawings on a page |
| Writing in a crooked manner | Cannot stay on ruled lines, it is bent or twisted |
| Misaligning both horizontal and vertical series of numbers | Reversing letters and/or words while one is writing and copying text |
| Mistaking words with similar beginnings and/or endings | Confusing likenesses and minor differences |

It is possible to see learners fail to visualise or understand what they are reading either silently or orally. They might whisper to themselves for reinforcement while reading silently, and they return to pointing to decide where they are in the text. Comprehension might also be reduced as reading goes on. Learners with vision challenges often lose interest quickly, especially during conducting near tasks. Teachers need to know that such learners often mispronounce similar words as they continue reading, even the words they have seen many times. This is because the letters are seen in different positions or the words seem to be double. Some often blink during desk tasks and reading, but not at other times as well. If they hold books at a very short distance or the face is close to the surface of the desk, the children should undergo vision screening. Observe if a given learner is avoiding near-centred tasks and complaining about discomfort during conducting near vision tasks. Covering one eye during reading is a sign of problems with coordinating both eyes. Those who have difficulty seeing writings on the blackboard will make errors or fail to copy writings from the board into a notebook. Even copying texts from reference books into the notebook can be challenging. Near-sighted learners often squint when they are reading what is written on the chalkboard.

They need to be closer to the board. Rubbing the eyes after a short time of doing a visual activity means that the eyes are tired. The blinking turns the vision system off and on and the child feels the activity is clearing up the vision for some seconds.

## 7.5 Methods of developing vision perception

Visual perception refers to the ability of the brain to make sense of inputs from the eyes, but the inputs need to be clear, single and well received. Good visual perceptual skills are important in nearly all everyday activities, including reading, writing, puzzles, cutting, drawing, completing math problems, dressing, finding objects on the floor as well as many other activities. Without the ability to complete these tasks, a learner's self-esteem can suffer and academic and play performance is restricted. If one has reduced colour vision, it is hard for one to understand the concept of colours.

Teachers must develop learners' vision perception. There must be an educational intervention to help learners with visual perceptual difficulties. The intervention is important and must be built on an assessment of sensor visual qualities as well as on the eye motor capacity. Eye motor capacity is made to improve the ability to do visual tasks. The learner needs stimulation to engage in and complete academic tasks. For some, this might even help them to do tasks such as putting a shoe on the right foot. The intervention helps to prevent the learner from being disengaged from an academic environment due to the difficulty in completing visual activities (e.g., writing, cutting and drawing) and avoid the frustrations experienced by parents, teachers and children. The goal is also to maintain and develop a positive sense of independence and self-confidence. Development of vision perception might also change the vision sensor capacity and enable one to develop better eye movements like accommodation, convergence and saccades. It has to be ensured that the learner does not fall behind his or her peers in the development of skills such as handwriting and spelling.

1. What is my current understanding of methods of developing vision perception?
2. What else do I need to learn about the actual methods of developing vision perception?
3. What strategies should I use to understand well the methods of developing vision perception?

Flip charts, marker pens, projectors, computers, picture cards, different texts about using writing boards, pictures, writing boards, Edtech and real objects

**Time :90 Minutes**

Mastering methods of developing vision perception

**Steps**

1. Use the library and Internet sources to read about methods of developing vision perception.
2. Choose appropriate methods of developing vision perception.
3. Evaluate the strengths and weaknesses of the methods you have chosen for developing vision perception.
4. Apply the methods chosen to developing the vision perception of some learners from nearby schools.
5. Assess the methods used to developing vision perception in Tanzania.
6. Share the results with your fellow teachers for reflection.
7. File what you have summarised in them in your portfolio.

1. How was the task?
2. How did it help you to understand the methods of developing vision perception?
3. If you were given another chance, how differently would you do the task?

1. What are your main assumptions with respect to the methods ofdeveloping vision perception?
2. Discuss the methods of developing the vision perception of learners with vision disturbances.
3. Elaborate the application of the methods of developing vision perception in Tanzania.

1. How effective was the learning?
2. What challenges did you face when learning about the methods of developing vision perception?
3. What else do I need to understand the methods of developing vision perception?

A learner with good vision must have good sensory processing with accurate registration, interpretation and response to sensory stimulation in the environment and the learner's own body. The learner must have visual attention to focus on important visual information and filter out unimportant background information.

His visual discrimination must be high enough to determine differences or similarities in objects based on size, colour, shape, etc. With a visual form constancy, learners understand that a form or figure is the same, although it is smaller or larger, or has changed its colour, light conditions or position. If learners have a high visual memory, they can recall visual

forms and understand the visual spatial relationships between objects in their environment. The ability to recall a sequence of objects in correct order, a visual sequential memory and the ability to locate something in a busy background, figure-ground discrimination, must be developed. It is possible to work on visual closure, which helps the learner to identify forms even when the parts are missing.

A visual disturbance influences and forms visual perception. Learners might struggle with completing puzzles or with dot-to-dot drawings because these are seen as being double or are changing places. Letters with similar forms (b, d, p, q) can be a problem for learners with spatial problems and all children need to learn the prepositions explaining different space positions (under, down, in, out, on, up, at the back). Furthermore, reversing numbers or letters in writing and calculations is a perception challenge often caused by eye-motor problems.

The foregoing learners have diffuculty remembering an often-seen word because the letters change position and the word looks different each time. For some learners' the stimuli from the visual field are so dominant that they are easily attracted to what is going on around them (colours, movements, etc.) and have problems concentrating on work that needs focusing on. To help learners with eye-movement disturbances and vision perception challenges, teachers need to know how the learners' vision functions. Is there any reduction in visual acuity at near or long distance, and are the saccades, accommodation and convergence normal? If schoolwork includes coloured information, it is important to know if the learner has colour vision. Dots can show where to start writing or reading and directional arrows might be helpful for direction or starting

position. Grid paper is useful for word spacing and sizing. Teachers can highlight where to write to make learners achieve correct line alignment. Some learners need the text from the board copied on a sheet of paper on their desks. Other methods include using alphabet strips, eliminating clutter, putting the desk away from distractions and eliminating dazzling light.

Some learners need visual activities to be divided into small steps. Hidden picture games, picture drawings, dot-to-dot worksheets or puzzles, word-search puzzles, sensory activities and construction-type activities are often stimulating to learners with visual problems when they are used in a structured way.

Teachers can use flash cards with letters and words, and numbers and small calculations can be shown in front of the child in different angles. The learner must keep the head steady to strengthen visual attention and eye movements. These activities also help to develop visual perception. Learners with vision problems must undergo a through medical check.

1. What new information have you learnt which you would like to apply in your classroom in future?
2. What else do you need to learn about methods and measures for preventing vision disturbances? Why?
3. How would you use the knowledge gained in this unit to prevent vision disturbances among learners?

## Conclusion

Once the assessment of vision is done learners, parents and teachers need the findings. Visual disturbances can be confusing to the child himself and other

people because the learner can see but has problems in certain settings. To get information on why the problems exit and to secure medical treatment, learners with serious problems must be referred to ophthalmologists, paediatricians or opticians. Be aware of quick changes in vision functions and if vision problems are worsening, the teacher must inform the parents immediately. The parents must take the child to hospital.

As a teacher, you must do your best to prevent vision disturbances among your learners. Make sure that good viewing conditions for all learners are found in the classroom. They all need to learn comfortably. Learners identified with vision disturbances can be helped through vision stimulation, proper placement and the right viewing conditions.

American Psychological Association. (2022).Placement retrieved from: https://dictionary.apa.org/educational pacement.

Bonilla-Warford, N. & Allison, C. A. (2004). A Review of the efficacy of oculomotor vision therapy in improving reading skills. *J Optom Vis Dev*, 35, 108-15.

Christian, L. W., Nandakumar, K., Hrynchak, P. K., & Irving, E. L. (2018). Visual and Binocular Status in Elementary school children with a reading problem. *Journal of Optometry*, 11, 160-166. Doi:10.1016/j. optom. 2017.09.003

Collins, M. E., Guo, X., Repka, M. X., Neitzel, A. J. & Friedman, D. S. M. (2022). *Lessons learned* from school-based delivery of vision care in baltimore, maryland. Asia-*Pacific Academy of Ophthalmology*, 11(1), 6-11. Doi:10.1097/APO.0000000000000488.

Felder, M., Wilhelmsen, G. B., & Schneiders, K. (2021). Developing "vision-for-learning" Competencies among Teachers in Tanzania. *Creative Education*, 12, 82-102. Doi:10.4236/ce.2021.121007

Monkeys, C. (2022). *What is visual perception*. What can be done to improve visual perceptual skills? https://www. cheekymonkeysot.com/2022/02/28/what-is-visual-perception/

Radach, R. & Kennedy, A. (2013). Eye movements in reading: Some theoretical context. *Quarterly Journal of Experimental Psychology*. Doi:10.1080/17470218.20 12.750676

Reading Rockets (2022). Phonological and phonemic Awareness: Introduction. https://www.readingrockets. org/teaching/reading101-course/modules/ phonological-and- phonemic-awareness-introduction

Sterner, B., Gellerstedt, M., & Sjöström, A. (2004). The amplitude of accommodation in 6-10-year-old children—not as good as expected! *ophthalmic & physiological Optics*, 24, 246-251. Doi: 10.1111/j.1475-1313.2004.00201.x

Wilhelmsen, G. B. (2012). Children's functional vision. Provides visual impairments not classified to ICD-10 needs for action? [*Barns funksjonelle syn. Gir synsvansker som ikke klassifiseres etter ICD-10 behov for tiltak?*] Project report, HiB.

Wilhelmsen, G. B. & Felder, M. (2021). Structured visual learning and stimulation in school: An Intervention Study. *Creative Education*, 12, 757-779.

# Unit Eight

## Communicating vision disturbances to society

### 8.1 Introduction

Screening, identification and assessment of learners with vision disturbances are followed by the development of intervention protocols on educational needs. The screening, identification and assessment of learners are conducted to make sure that the accommodation of learning needs is addressed and that learners continue with education with appropriate modifications. However, the engagement of learners from screening through making of interventions to classroom accommodation and modification has to be communicated to parents, schools and other educational authorities. The communication with society is very important as it gives feedback to what the learner is experiencing and on the measures taken to achieve better academic performance.

In this unit, you will learn how to communicate vision disturbances to society. You will also learn how to communicate visual disturbances found among learners in school to learners, parents, teachers, eye-health medical professionals and school authorities. You will learn how to effectively communicate vision-related issues to professions. After completing this unit, you are expected to be able to use different methods and approaches to effectively communicate to professionals learners' vision disturbances. You are also expected to be able to communicate vision disturbances among learners and the importance of good viewing conditions in classrooms to learners, parents, eye medical proffesionals and educational authorities. This is aimed at facilitating learning in schools.

In this unit, you are expected to develop the following competencies:

(a) Communicating vision-related issues to other professions

(b) Communicating visual disturbances in schools to learners, parents, teachers, medical eye-health professionals and school authorities

**Time: 10 Minutes**

1. What methods do you use in communicating vision disturbances to school authorities?
2. What methods do you use in communicating visual disturbances in school to learners, parents, teachers, and school authorities?
3. How do you normally communicate vision disturbances to proffesionals?

1. How was the task?
2. How did it help you to understand how to communicate vision disturbances to society?
3. If you were given another chance, how differently would you do the task?

## 8.2 Communicating vision disturbances to learners, parents and other community members/society members

Teachers want their learners to succeed and thus work towards connecting them with their parents and other educational activities. Teachers need to have adequate knowledge of how to write vision assessment reports on a learner and be able to share the results with fellow teachers. Also must also know how

to give information and arrange meetings to discuss general vision-related issues and communicate individual challenges to parents and guardiands. This includes explaining the cause of the problem and the measures that can be taken to address it.

Communication and advocacy are tied together. Communication between teachers and parents enables the latter to understand their children's functional vision challenges. The teacher must be able to present knowledge and thoughts to those involved in the activity. If there are any disagreements on the solutions to adopt, the teacher must do some research. This includes learning from parents, other educational authorities or vision specialists about the materials and methods used with learners of the same age and with the same vision functions as your learner. You can also search for studies on the topic. If the learner has an Individualised Education Programme (IEP), the teacher must review the assessment reports and update the plans.

1. What is my current understanding of communication of visual disturbances in school to learners, parents and school authorities?
2. What else do I need to learn about communication with learners, parents and other people learners, parents and school authorities?
3. What strategies should I use to understand better communication with learners, parents and other people learners, parents, and school authorities?

Flip charts, projectors, audio-visual materials, marker pens, different texts about using writing boards, pictures, writing boards and real objects

**Time : 120 Minutes**

Facilitate communication of visual disturbances in school to learners, parents and school authorities

**Steps**

1. Visit the library and Internet sources to read about communication of visual disturbances to learners, parents and school authorities.
2. Discuss how to arrange meetings for discussing general visual issues.
3. Choose appropriate methods to communicate individual challenges, the cause of the challanges and the measures to be taken to address them to the parents and guardians.
4. Evaluate how to write understandable vision assessment reports for teachers and guardians.
5. Apply the methods chosen in communicating visual disturbances to learners, parents and school authorities.
6. Assess the methods used in communicating vision disturbances and viewing conditions in Tanzania to learners, parents and school authorities.
7. Share what you have leant from the library with your fellow teachers for reflection.
8. Write a summary on what you have done and file it in your portfolio.

1. How was the task?
2. How did it help you to understand the methods of communicating visual distances to learners, parents and school authorities?

3. If you were given another chance, how differently would you do the task?

1. What are the main assumptions in communicating visual disturbances to learners, parents, teachers and school authorities?
2. Discuss the methods of communicating visual disturbances to learners, parents, teachers and school authorities.
3. Elaborate the application of communication visual disturbances in Tanzania to learners, parents, teachers and school authorities.

1. How effective was the learning?
2. What challenges did you face when learning about communication of visual disturbances to learners, parents, teachers and school authorities?
3. What else do I need to understand well communication of visual disturbances to learners, parents, teachers and school authorities?

As a teacher who has screened, identified, assessed and stimulated learners with vision disturbances, you must maintain contact with parents and other educational authorities. Through this communication the magnitude of the problem can be shared with the educational team. In this way, you can work together as a team, rather than working with the child alone, without anybody else understanding the problem or knowing how to address it. Many other professionals may work with the learner, including a physical therapist, an occupational therapist, a nurse or a counsellor. Thus, it is important that all

key stakeholders know about the vision problem facing the learner.

As a teacher, you should demonstrate commitment to the professional values of integrity, trust, respect and social justice. A teacher, should demonstrate commitment to the professional values of integrity, trust, respect and social justice. Supporting learners and other members of the school community who have vision challenges is a key part of the role that you play as a teacher. All teachers should understand what it means for learners with vision disturbances and should be of the support available. Concerns about vision are often raised by parents at an early stage and confirmed by health professionals. However, class teachers are in the best position to identify undiagnosed possible signs of vision disturbances through interpretation of visual information and to provide advice. They need to be role models and demonstrate welcoming, encouraging and inclusive behaviour. In so doing, teachers help to share the state of learners' vision as well as their academic development with parents and other educational authorities.

## 8.3 Communicating vision-related issues to professionals on vision

Communicating issues about children who are in need of special services from school and the health system because of a complex health and learning situation to proffesionals is often challenging. Communicating with parents is a critical factor when it comes to learners' medical and educational needs. It is important to know how to communicate and build a good relationship between the school and the learner's family. It is important to build teams of professionals to make contact with each partner easier. It is also necessary for professionals to make sure that the teacher and the medical doctor have the same information as themselves. To support effective communication, vision professionals must respect other professionals, listen to their information and share experiences from the education field. This might help to get an overview

of learners' challenges. A professional must keep copies of documentation such as reports, notes and telephone logs so that they can be shared with other professionals and referred to when necessary. Exchange with the professionals who are engaged with the learner contact information so that you can share information or ask questions whenever needed.

1. What is my current understanding of communicating vision-related issues to other professions?
2. What else do I need to learn about communicating vision-related issues to other professions?
3. What strategies should I use to understand well communication vision-related issues to other professions?

Computers, mobile phones, iPads and textbooks

**Time : 120 Minutes**

Facilitating communication with professionals about vision

**Steps**

1. Visit the library and Internet sources to read about communicating vision-related issues to professionals.
2. Evaluate how to read and understand descriptions by ophthalmologists and opticians.
3. Choose appropriate methods for writing reports that will be understood in the health sector.
4. Evaluate the strengths and weaknesses of the methods you have chosen for communicating with other professions.
5. Apply the methods chosen to communicate vision-related issues to other professions.

6. Assess the methods used in communicating vision-related issues to professionals in Tanzania.
7. Share with your fellow teachers for reflection.

1. How was the task?
2. How did it help you to understand the methods of communicating vision-related issues to other professions?
3. If you were given another chance, how differently would you do the task?

1. What are the main assumptions in communicating vision-related issues to professionals?
2. Discuss the methods of communicating issues related with learners with visual disturbances to other proffesionals.
3. Elaborate the application of communicating vision-related issues to other professionals.

1. How effective was the learning?
2. What didn't go well while you were learning about communication vision-related issues to other professions
3. What else do I need to understand better communicating vision-related issues to other professions?

Teachers of learners with vision disturbances must be able to communicate the disturubances to other professionals. The communication needs to be effective in terms of reading and understanding the descriptions and prescriptions from ophthalmologists and opticians. Communication with other professionals is intended to show how better the vision teacher can write reports that can be understood in the health sector. In communicating with other professionals, teachers discuss learners' progress and suggest strategies for making their schoolwork accessible including extracurricular activities. As learners learn more and increase their understanding ability to communicate and follow directions, the eye care specialist will be able to get more detailed information about their vision. Teachers must share that information with other professionals to make sure learners' visual needs are being monitored.

1. What challenges did you face while carrying out the activities in this unit?
2. How did you manage the challenges?
3. How would you use the knowledge gained from this unit to communicate learners' visual chaallanges to other learners, professionals, parents and other stakeholders?

## Conclusion

Creating awareness among various stakeholders in the community, especially parents, is perhaps the most important outcome of the interventions made in the learning process. More often, parents know more about their children than teachers do. Therefore, teachers of learners with vision disturbances must communicate with other professions and other people, especially parents. They

need to know how to read and understand the descriptions by ophthalmologists and opticians, and how to write reports that will be understood in the health sector. Teachers need to be able to communicate visual disturbances in school to learners, parents and school authorities. They also need to collect, organise, share information and organise meetings for discussing general vision issues.

Bonilla-Warford, N. & Allison, C. (2004). A review of the efficacy of oculomotor vision therapy in improving reading skills. *Optometry & Vision Development*, 35(2), 108-115

Du, K. et al. (2022). Teacher-to-parent communication and vision care–seeking behaviour among primary school students. Hong Kong Med. 28(2),152–60. Doi:10.12809/hkmj208820

General Teaching Council for Scotland, gtc. (2021). *Meeting the needs of learners with visual impairment. A professional guide for teachers.* In partnership with Scottish Sensory Centre. https://www.gtcs.org.uk/wp-content/uploads/2021/09/professional-guide-meeting-needs-learners-with-visual-impairment.pdf