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Low Vision Devices For The Blind, Yes. What Are The Challenges?

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Abstract: ***It has been observed that when users of low vision devices view through the optical centre of the devices, they tend to shield light that fall at the centre thus reducing visibility of whatever one was to regard, such positions cause fatigue for the low vision user thus reducing the time taken on task, and limit low vision functioning. Some devices like the stand magnifiers and the C.C.T.V are bulkier to handle and as such may not be portable on excursions. It would seem that most low vision devices are useful in classrooms where one has to sit at a desk and view through the devices. Such arrangements tend to limit usage and therefore imposing limitations of function to the user. Stand magnifiers that use batteries require regular supply of batteries. The extra expense of buying batteries and bulbs can make them unaffordable to some learners. Proper visual environment which allows for maximum comfort and visual performance is essential for the low vision learner. In designing the proper visual environment for children with visual impairments, careful consideration should be given to the individual needs of each low vision learner based on the requirements of the visual task. With proper training learners with low vision can read rapidly with optical devices. The study by Sykes (quoted in Harley, 1984) indicated that visually impaired high school students were able to read as well with optical devices and standard print as with large print. Since large print is not always available, optical devices can provide a more convenient and equally effective choice for some learners with low vision. Before beginning class activities, the classroom must be prepared to maximize the amount of time the student will spend on the activity. Barraga (1983) noted that magnifying devices and prescription of optical aids have received increasing attention from clinicians and instructors as a valuable means of increasing the use of functional vision and efficiency in both near and distance visual functions. The purpose of this study was to find out challenges posed by low vision devices to learners with low vision. The study was carried out in five primary schools for the visually handicapped in Kenya. The study population included 90 teachers and 80 eight learners with low vision, a sample of 65 teachers and 78 learners took part in the study. Survey research design was used to collect data. Research instruments were questionnaires, observation schedule, interview schedule, a reading proficiency test and document analysis. Validity of the instruments were overcome by the researcher giving the research instruments to three experts on the topic of study who validated the contents of the instruments. Reliability was done by test re-test method. Data was analyzed by use of descriptive statistics that included frequency counts, percentages and the means. Findings of the study were that low vision learners lacked devices that can make them access curriculum content to the full. Recommendations of the study were: regular case conferencing be held among low vision team members to chart out learning needs of learners with low vision, and more contact time for the schools for the visually handicapped be created. Findings from the research could help curriculum developers at the Kenya Institute of Education to adapt and improve on low vision training curriculum. The Directorate of Quality Assurance and Standards also will glean information that will help in stocking classrooms with optical and non-optical low vision devices.***

Keywords: Challenges; Low vision learners; Low vision devices.

I. BACKGROUND OF THE STUDY

Among the drawbacks of using some stand magnifiers is the difficulty of viewing in positions that require the individual to bend forward over the lens and viewing surface to use the optical centre of the device. The position is not only physically fatiguing, but it also causes the user's head and body to block overhead sources of illumination (Jose, 1995).

The field of view may be limited depending on the magnification (the greater the magnification, the smaller the field of view)

- ✓ Stand magnifiers are generally bulkier than the handheld magnifiers.
- ✓ One or both hands must be used.
- ✓ Stand magnifiers with built in illumination systems require users to change bulbs or batteries, regularly thus making them expensive to run.
- ✓ The focal distance must be held constant, a skill that may be difficult for learners with hand tremors.
- ✓ The field of view is limited, depending on the magnification (the greater the magnification, the smaller the field of view therefore the less the learner sees the target).
- ✓ Hand-held magnifiers are not ideal for low vision individuals with poor eye-hand coordination or poor fine-motor skills because they cannot maintain focal distance.
- ✓ One or both hands must be used thus in some cases the low vision devices may not be used during a writing activity.

It has been observed that when users of low vision devices view through the optical centre of the devices, they tend to shield light that fall at the centre thus reducing visibility of whatever one was to regard, such positions cause fatigue for the low vision user thus reducing the time taken on task, and limit low vision functioning.

Some devices like the stand magnifiers and the C.C.T.V are bulkier to handle and as such may not be portable on excursions. It would seem that most low vision devices are useful in classrooms where one has to sit at a desk and view through the devices. Such arrangements tend to limit usage and therefore imposing limitations of function to the user.

Stand magnifiers that use batteries require regular supply of batteries. The extra expense of buying batteries and bulbs can make them unaffordable to some learners.

Devices like hand held magnifiers require the use of both hands. In some cases, users may have developed hand tremors that make it impossible to hold them in focus. Such limitations make the use of devices to be counterproductive in the sense that the users of the same cannot find them useful in performing visual tasks. It therefore follows that low vision devices cannot be put into good use by the learners with hand tremors or those with poor eye-hand coordination because they cannot maintain focal distance.

STATEMENT OF THE PROBLEM

Learners with low vision had been treated as if they were totally blind and were required to read and write in Braille as the totally blind learners do. Some learners were even blindfolded in order for them to read tactually. The reading of Braille tactually limited low vision learners to using a more inferior modality of learning. In the early 1960s, Barraga experimented with severely visually handicapped children and found out that with proper training andsupport, such learners could function visually. In Kenya, 52% of learners with visual impairments in schools for the visually handicapped have low vision The proportion of learners with low vision surpass that of those who are blind, and therefore they require deliberate efforts to train them in low vision techniques. The low vision training programme was then introduced in all six primary schools for the blind and later incorporated learners with low vision in integrated programmes across Kenya. The Ministry of Education (Kenya) initiated a programme for low vision training in 1994. From the time the programme was launched to date, there has been no study carried out to audit and/or evaluate the influence of the low vision training programme on learners' visual performance during curriculum intercourse. It has yet to be established as to how low vision devices influence learners' reading and writing ability. No inventory of low vision devices has been done to determine which ones are popular with learners and which ones are least useful. This research established how low vision training influence learner's reading abilities, for learners who are low vision in Kenya.

PURPOSE OF THE STUDY

The purpose of this study was to find out challenges posed by low vision devices to learners with low vision.

OBJECTIVES OF THE STUDY

The current research was based on evaluation of the following objective:

- ✓ Find out challenges posed by low vision devices to learners with low vision.

RESEARCH QUESTIONS

The study was guided by the following question:

- ✓ What challenges do learners with low vision experience from using low vision devices?

SCOPE OF THE STUDY

The study involved teachers who teach children with low vision in schools for the visually handicapped and was delimited to learners with low vision who use optical and non-optical low vision devices in special schools and integrated programmes.

ASSUMPTIONS OF THE STUDY

The following were the assumptions of the study:

- ✓ All learners in the study use low vision devices when performing curriculum tasks.
- ✓ All learners in the study require environmental adaptation to maximize on their vision use.
- ✓ All teachers who worked with learners with low vision were sighted.

LIMITATIONS OF THE STUDY

The researcher faced several limitations that hindered proper observation and documentation of challenges learners with low vision experienced. Some of the limitations were:

- ✓ Professionally, some teachers who were blind tended to discourage learners from using low vision devices

because the teachers could neither read nor mark the learners work in print.

- ✓ The number of specialist teachers from special schools for the visually handicapped acting as respondents had limited teaching experiences of working with learners with low vision to be able to understand the learning needs and the effect of low vision devices on visual functions of the visually handicapped.
- ✓ Limited low vision devices available for learners to perform various tasks during curriculum intercourse constrained the researcher from finding out the actual visual efficiency of learners with low vision.

To overcome some of the limitations, the researcher involved teachers who had had three months of in-service training and those who had had a two year diploma special education qualification.

CONCEPTUAL FRAMEWORK

The study was based on management-oriented evaluation approach as propounded by Stufflebeam's Context, Input, and Process Product (CIPP) evaluation model.

Stufflebeam et al. (2000), and Guba and Lincoln (1981) developed an evaluation framework to serve managers and administrators facing four different kinds of educational decisions named context, input, process and product. He proposes that evaluation should be done in order to establish the programme's actual position in relation to the four components. He has suggested various questions to be answered in each of the four components during an evaluation as shown in Figure 1.

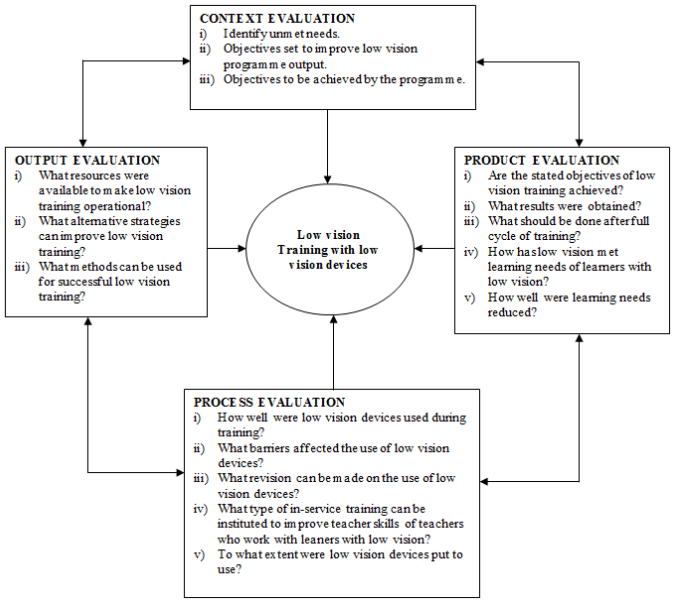

Figure 1: Context, Input, Process, Product Evaluation (C.I.P.P) of the Low Vision Training Programme

SIGNIFICANCE OF THE STUDY

The findings from this study may contribute to the existing body of knowledge on low vision functioning and influence practice and sourcing for low vision devices and other related equipment that can be effectively used by low vision learners. It is also hoped that curriculum developers may glean information that will help in adapting the curriculum for low vision learners. The findings may dissuade policy makers and specialist teachers for the visually handicapped from treating the low vision learners as if they were blind by encouraging the learners to function visually.

II. METHODOLOGY

RESEARCH DESIGN

This research was a cross-sectional survey. A cross-sectional survey collects information from a sample that has been drawn from a predetermined population (Fraenkel & Wallen, 2000). The predetermined population were learners with low vision in grades seven and eight from schools for the visually handicapped in Kenya. The researcher found the survey method appropriate because data collection using questionnaires and observation schedules took a shorter time as compared to interview method. Response rate was high because the researcher personally visited the schools where the questionnaires were administered and any clarity about the questions on the questionnaire forms were immediately responded to. It was also found to be appropriate because the questionnaires were administered in groups thus permitting follow-up questions, and also comparative cost of administering the questionnaire was cost effective (Fraenkel and Wallen, 2000). The main purpose of the survey was to describe characteristics of a population. In this case the researcher set out to find out reading proficiency of learners with low vision when using low vision devices.

STUDY AREA

This study was conducted in five primary schools for the visually handicapped in Kenya. The study was conducted in special schools for the visually handicapped because learners with low vision get admission to such schools. Such schools are also resource centres for special materials for learners with visual impairments.

The schools are spread regionally as follows:

Kibos and St. Oda schools for the visually handicapped are situated in Nyanza province. Thika School for the visually handicapped is situated in Central province in Thika town. Likoni School for the blind is located in the Coast province and St. Lucy school for the visually handicapped in Meru.

STUDY POPULATION

Learners who participated in the study had low vision and were from grades 7 and 8 from schools for the visually impaired in Kenya. Schools for the visually impaired in Kenya admit both blind and low vision learners to the same school and learn alongside one another. They share education resources such as text books that may be either in Braille or print, teachers, and share same classrooms. The current research excluded learners who are blind. Saturated sampling was used to select seventy eight learners from the five schools as follows: School A = 14, School B = 13, School C = 15,

School D = 17 and School E = 19. The learner participants in the study were confirmed to be with low vision from reports written by ophthalmic workers from Kikuyu and Sabatia hospitals and kept by each school on file. The researcher used mainly special schools for the learners with visual impairment because such schools were considered as centres of excellence where both teaching and learning resources were available and that such schools used specific special methods to teach learners with visual impairments.

SAMPLE SIZE AND SAMPLING PROCEDURE

Cluster sampling was used to select classes that took part in the research In this case the unit of sampling was not the individual but rather a naturally occurring group of individuals. Cluster sampling is used when it is feasible to select groups of individuals than it is to select individuals from a defined population Therefore classes seven and eight were used as the cluster sample. Saturated sampling was used to select all learners with low vision in grade 7 and 8 to take part in the study. Seventy eight teachers who teach classes seven and eight in five schools for the visually impaired were selected out of ninety teachers. Saturated sampling was used to select sighted teachers who taught learners in classes seven and eight, however, totally blind teachers did not take part in the study because they had very little information about learners with low vision.

Categories	Total Number	No. selected	Percentage
Schools	6	5	83.33
Classes	12	10	83.33
Teachers	90	65	72.22
Pupils	88	78	88.63

Table 1: Sampling Frame

RESEARCH INSTRUMENTS

The research instruments used in the study were questionnaires, interview and observation schedules.

QUESTIONNAIRE

There were two questionnaires, one for teachers and one for pupils. The teacher's questionnaire was structured to have three sections. The first section was aimed at soliciting background information about the school, the number of children on roll, the number of low vision learners taught through the visual modality and the equipment used during curriculum discourse. The second section was aimed at obtaining information about the expertise of teachers working with children with low vision. It also dealt with soliciting information about the availability of low vision devices that learners with low vision used during curriculum discourse. A total of 20 items made up the teachers' questionnaire.. The pupils' questionnaire was made up eleven items that were aimed at gathering data about attitudes of learners with low vision.

INTERVIEW SCHEDULE

The interview schedule was made up of ten questions that were aimed at eliciting the teachers' expertise as relates to working with learners with low vision.

The interview schedule was also aimed at establishing the number of low vision devices available to learners in class.

OBSERVATION SCHEDULE

The observation schedule was arranged in three distinct sections. The first section solicited information about availability of optical low vision devices. It specifically determined as to whether the devices were adequate or not adequate to the learner's needs.

The second section solicited information about the availability of non-optical low vision devices. It solicited information about environmental modification of the learning environment. The third section solicited information on the actual learners' use of low vision devices during curriculum discourse.

VALIDITY OF THE INSTRUMENTS

Validity refers to the degree to which the explanations of a phenomenon or the findings of a study match the realities of the world, or the extent to which a questionnaire actually measures what it is intended to measure (Oso, 2013). Validity of the instruments was evaluated and improved through face validity method. This method was selected because of its ease in computation, understandability, focus on agreement of relevance and provision of both item and scale information (Orodho, 2010). To ensure face and content validity of the research instruments, two supervisors who are experts from the department of Special Needs of Maseno University were requested to make judgment on the Instruments based on their relevance of content in the adapted questionnaires. They made amendments on format of the questionnaires and provided feedback to the researcher who made amendments on the format of the questionnaires and content in general. Their recommendations were incorporated in the final questionnaires to enable collection of data valid for analysis. However, for the qualitative data, validity was ensured by arranging the items in the interview schedule from simple to complex. The language used was also made clearer and simpler for probing for more details.

RELIABILITY OF THE INSTRUMENTS

Reliability is a measure of the consistency with which research participants understand, interpret and respond to the item in an instrument (Oso, 2013). The researcher employed a test-re-test method to determine the reliability of the instruments. Test-re-test method is a statistical technique used to estimate components of measurement error by repeating the measurement process on the same subjects, under conditions as similar as possible, and comparing the observations using a suitable technique (Orodho, 2010). The method was selected because it was the most conservative method for assessing the outcomes of two tests generated in the same way from the same content domain over time (Orodho,2010). This was the simplest way of testing the stability and reliability of an

instrument. The researcher conducted an intraclass correlation between the first measurement (test) and a subsequent measurement (retest), which was conducted after two weeks. A test–retest reliability coefficient of 0.75 which was achieved led to the conclusion that the instruments were of adequate reliability, in line with recommendation of Creswell (2013) and Orodho (2009).

DATA COLLECTION PROCEDURE

The researcher applied for research authorization permit from National Council for Science and Technology. The investigator telephoned the head teachers of schools of the visually handicapped, and informed them about the intention of carrying out research in their respective schools. Visits were made to schools for data collection. Teachers and learners were informed about the visit and intended research and were requested to cooperate. Thereafter, the researcher administered data collection instruments. The researcher was introduced to the teachers and pupils in grades seven and eight by the head teachers of respective schools. After telling the teachers about the visit to the schools, the researcher requested them to take part in the research by filling in the questionnaire forms and then return them to him. The same was done to learners in grades seven and eight. The questionnaire for learners with low vision was administered by class teachers who were required to distribute them to the learners and then instruct them to respond to the questionnaire items using their low vision devices if possible.

DATA ANALYSIS PROCEDURE

The information gathered from the questionnaires and observation schedule was analyzed using descriptive statistics where frequency counts and percentages were used to evaluate the results of learners who used low vision device then results were reported in tables and figures. Percentages were used to evaluate usage of low vision devices.

III. DATA PRESENTATION, ANALYSIS AND DISCUSSION

EXTENT LEARNERS USE SPECIALIZED LOW VISION DEVICES

Teachers were asked to indicate whether learners use specialized low vision devices or not. Their responses are presented in Table 2.

n = 65

Response	Frequency	%
Yes	58	89.23
No	4	6.15
No Response	3	4.61

Table 2: Specialized Low Vision Devices used by Learners in Class

Majority 58 (89.23%) of the teachers said that they had specialized low vision devices for learners to use within classrooms. Minority 4 (6.152%) answered in the negative, and three respondents (4.61%) did not respond to the question. Among the specialist devices that teachers had in their classrooms included: magnifiers telescopes, CBM boxes (reading/writing stands) large print books, adapted desks, C.C.T.V, bold line exercise books, spectacles, hand held magnifiers, lupes, coloured pieces of chalk, sun glasses, monoculars spectacle mounted low vision devices and non-optical devices e.g. felt pens. Head borne devices had been prescribed for learners after cataract extraction and hand held magnifiers were task specific for particular learners in class to make use of during curriculum activities.

The above information was corroborated with data gathered from the pupils' questionnaire in item number five where respondents were asked to state advantages they got from reading with low vision devices. Forty four respondents (55%) responded that print become clearer, twenty seven learners (33.75%) said that reading become easier, one respondent (1.25%) said that he does not tire quickly while one respondent (1.25%) said that low vision devices are not beneficial when reading.

Teachers were asked to indicate by way of ticking from a given list of low vision devices, those devices used by learners during curriculum discourse. Their responses were presented in Table 3.

n=65

Device	Frequency	%
Hand held magnifiers	52	80.0
Spectacles	52	80.0
Stand Magnifiers	54	83.07
Normal/Large print	50	76.92
Bold Print	32	49.32
Monoculars	34	52.03
Large Print books	26	40.0
Binoculars	23	35.38
C.C.T.V	16	24.61
Computers	16	24.61
Individual tasks lighting	15	23.07
Minified Print	11	16.92

Table 3: Low Vision Devices used by Learners during Curriculum Activities

Spectacles and handheld magnifiers (80%) came out clearly as the main optical low vision devices that were in vogue in schools for the visually handicapped. Though few respondents indicated that other low vision devices are regularly used, for example large print and minified print books were needed by specific visual conditions. Learners with retinitis pigmentosa and glaucoma had restricted visual fields that may necessitate the use of minified print. Cases where learners have central scotomas may require that learners use large print. It was noted that large print is achieved by use of hand held and stand magnifiers to magnify what the low vision learner is involved with.

Though 16 respondents (24.61%), indicated that they use C.C.T.V. while working with learners in class. The researcher found out that each school had one C.C.T.V in the low vision resource room. A close observation indicated that the CCTVs had gathered dust, because of limited usage. One school had three CCTVs in the resource room but not in the classrooms. Task lighting, minified print, and computers were indicated to be in use with low vision learners however only one integrated programme had three computers for training learners at the resource room, but not in the classroom.

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The information gathered above is consistent with what Bachofer (2007) and Wilkinson (1996) when each stated that efficiency in the use of low vision devices may play a role in determining a learner's academic success and self-confidence. They further noted that by using magnifiers the students can share in vivid descriptions of common items such as insects held in a shallow dish. It should be noted that using devices in activities that take place within the classroom and beyond, the students are able to fully participate with peers and sometimes even add additional details missed by impaired vision. and number work. Three respondents did not respond to the question.

Teachers were asked to suggest problems they experienced from working with learners with low vision. Their responses are presented in Table 4.

n=65

Problems Teachers Experienced	Frequency	%
Learners have omissions and reduced reading proficiency	25	38.46
Learners were too slow without magnifiers	29	44.61
Problems of reading long passages	20	30.76
Lack of large print books	29	44.61
Developed poor posture due to close working distance	21	32.30
Lack of special lighting	19	29.23
Problems of miscall and poor spelling of words	24	36.92

Table 4: Problems Teachers Experienced when Teaching Learners with Low Vision

A good number of teachers 29 (44.61%) said that learners with low vision were too slow when not using magnifiers. 29 teachers also said they had problems because learners with low vision could not access large print books. 25 teachers (38.46%) responded that learners with low vision had omissions and reduced reading proficiency. 24 teachers (36.92%) reported that learners with low vision had problems with miscall of works and poor spelling. 21 teachers (32.30%) said that learners with low vision have problems of poor posture due to close working distance. 20 teachers (30.76%) reported that learners with low vision had problems reading log passages. 19 teachers (29.23%) reported that learners with low vision had problems of acquiring special lighting in order to perform visual tasks.

Majority of the teachers (89.23%) (see Table 5) said that they have specialized low vision devices for learners to use within their classrooms. Minority (6.15%) answered in the negative. However a spot check of the said facilities within classrooms when learners were asked to fill in their questionnaire revealed that the only visible low vision devices that were available and in use were head borne spectacles. Majorly those used by learners who have had intra ocular lens extraction. No learners were observed reading with handheld or stand magnifiers. It meant that what the teachers had said when responding to the questionnaire was at variance with the actual situation within classrooms. Exercise books with thick lines and felt-tipped pens were also used by learners in respective classrooms. Though 16 respondents (24.61%) indicated that they used CCTV while working with learners in class, it was observed that each school for the visually handicapped had at least one CCTV that is situated in the low vision resource room, it cannot be said that such a facility is readily available for learners to use in the classrooms during curriculum content interaction. Bachofer (2007) and Wilkinson (1996) observed that efficiency in the use of low vision devices play a role in determining learner's academic success and confidence. By using low vision devices, learners may vividly describe concepts that they regard clearly. Whereas majority of the teachers (80.0%) said that specialized low vision devices were required for all curriculum subjects, it would appear that learners have to make do with rudimentary devices. It can be pointed out here that low vision devices are like prosthetic legs for the physically handicapped that improve on their ambulatory requirements. Wilkinson (1996) and Bachofer (2007) observed that learners must be provided with low vision devices so that they can improve on the clarity and retinal spread of the images they regard. It must be said that learners with low vision require low vision devices so that they can gain confidence as visual learners. They need devices so that their esteem as low vision learners can be improved to that of learners who can learn how to learn visually. Through low vision device use learners can discover knowledge incidentally and develop positive attitudes as learners who can read across the curriculum with minimum support. However it must be pointed out here that most of the devices required improving of the learners' visual output were not availed to the learners. It means that learners kept on trudging on with poor vision that may be not enough to make learning enjoyable and meaningful to them. Suffice it to say that the low vision devices availability is wanting and there is an urgent need to avail the devices for learners to develop positive esteem as visual learners.

Some learners who have conditions like retinitis pigmentosa may need more light than the natural light through the windows. Such learners can benefit from individual or task lighting that can be placed on the learners' desks and directed to the visual tasks to be performed. Considering process evaluation, one may be interested in knowing how well the low vision programme is being implemented and barriers that affect programme success. Initially low vision therapists (two per school) were trained to begin work with learners with low vision. The low vision therapists went through in-service courses that fairly prepared then to begin work with learners with low vision. The low vision learners were initially supported by ophthalmic experts from Kikuyu eye hospital and later by eye specialists from Sabatia Eye hospital assisted learners from schools from the western region.

A major setback therefore in the use of low vision devices in the acquisition of curriculum skills and content, is lack of trained teachers who can understand and work with learners with low vision.

Another barrier is lack of adequate support for learning that include print books, reading/writing stands, inadequate teacher skills that can be used to teach learners scanning, localization skills with low vision devices and failure to complete course curriculum content in prescribed time.

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CHALLENGES LEARNERS EXPERIENCE DURING CURRICULUM INTERCOURSE

Teachers were asked to indicate from a list challenges learners with low vision experienced during curriculum interaction. Table 6 shows how respondents responded to the research question about challenges experienced by learners during curriculum interaction.

Teachers were asked to state challenges learners experienced during the learning process. Their responses were presented in Table 5.

n=78

Challenges	No. of Respondents	%
Difficulties of writing on straight line	60	76.92
Lack of large print books	54	69.23
Tire quickly due to very close working distance	46	58.97
Crowded diagrams in course books	49	62.82
Cannot cover curriculum in the time allotted	49	62.82
Lost devices take long to be replaced	48	61.53
Lack of prescriptive spectacles	38	48.71
Lack of writing and reading stands	36	46.15
Scanning with low vision devices	36	46.15
Lack of magnifiers	36	46.15
Lack of controlled lighting from learning environment	34	43.58
Poorly built classrooms	32	41.02

Table 5: Challenges Experienced by Learners with Low Vision during Curriculum Interaction

Writing on straight lines was ranked as the highest challenge (76.92%) that learners with low vision face. Jose (1985) pointed out that low vision individuals must scan visual tasks with their heads instead of eyes. As a result of this, tracking the pen or pencil when writing becomes difficult. It may also be possible that the page lines may be too feint to be seen by learners with low vision. The fact that tracking the movement of a pen across the page is difficult, the learner with low vision inevitably will write in zig-zag lines that are accentuated by poor eye-hand coordination and erratic scanning with the head instead of the eyes. Lack of large print books was second (69.23% most common challenge to low vision functioning. Without preferred size of print, retinal spread may be poor and such result in poor visual clarity and fatigue. Learners with low vision should be afforded the right size of print in order for them to have clear images and/or retinal spread that will make the learners with low vision to have sharp images that can be transmitted to the visual cortex.

If schools were equipped with photocopiers, sections of chapters from books could be enlarged to the right size of print for learners to read. Research findings indicated that only one school had a photocopier. Other possibilities of enlarging print are by use of optical low vision devices like hand-held and stand magnifiers that teachers had indicated that were in use during curriculum activities like reading and writing. However from observations made by the researcher, the devices may have been kept neatly away in the low vision resource room and were not given to the learners for use while performing curriculum tasks. Corn & Koenig (1996) strongly believes that low vision devices are very important to learners with low vision just like prosthetic equipment are to those with physical impairments, therefore it is of crucial importance that learners with low vision must of necessity have low vision device support in order to have better visual output. More so learners who have vision cells suppressed at the centre of the retinae e.g. learners with central scotoma, macular edema and macular degeneration need visual tasks to be magnified in order to improve on their retinal spread (Zimmerman, 1996).

Forty six respondents (58.97%) observed that learners with low vision tire quickly due to very close working distance. This observation is consistent with what Jose (1985) observed that low vision devices influence learners working distance. For example the higher magnification the shorted the working distances. It is the very short working distance that makes learners to tire readily. Scanning with the head and at the same time having to move the low vision device across the page that one is reading can also cause fatigue to one. Visual strains due to uncorrected refractive errors can also make learners with low vision to tire when performing visual tasks. Age inappropriate furniture can cause discomfort that lead to fatigue when one has to do seat work for a long time.

Inappropriate illumination can also cause visual fatigue and lowered visual output (Wilkinson, 1996). It therefore calls upon headteachers to make sure that learners are trained to use low vision devices proficiency by making sure that the learner can use the device correctly, clean them and keep them safely when not in use. Learners whose working distance is short or those that are called “Nose readers” should be helped to reduce fatigue by having visual tasks that are interspersed with physical activity so that muscles do not develop poor muscle tone, and fatigue.

Age appropriate desks should be provided for learners preferably those with adjustable desk tops or using reading/writing stands that can improve the learners’ ergonomics. Such facilities can reduce fatigue among learners. Crowded diagrams in course books and failure to cover curriculum content in the allotted time for all learners was noted as a problem or challenge for low vision learners. Barraga (2006) and Wilkinson (1996) both observe that learners with low vision have problems in discerning details from crowded diagrams. It would be noted here that learners with low vision require diagram adaptations. Crowded diagrams may need to be adapted to have fewer details. Learners who have central scotomas may also need diagram labels that are enlarged so that the learners can have proper retinal spread of the diagrams and labels they look at. Learners who have peripheral visual losses may require diagrams that have been minified and at the same time have fewer details. The above adaptations may be possible if each school for the visually handicapped had a photocopier that can be used to magnify and minify visual tasks as the need may be. Without adaptations to diagrams learners may take too long to look and see without much success.

A major challenge was completion of curriculum content within the stipulated period of time. For example the primary school cycle is intended to last for eight years. Jose (1985) notes that scanning and fixating with low vision devices tend

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to take more time of learners. It was noted that low vision learners tire quickly due to the effort required to read and/or write with low vision devices. This fact alone makes learners slower at accomplishing visual tasks. Therefore research findings in this paper tallied with Jose (1985) and Zimmerman (1996) who argued that learners take longer to accomplish curriculum content. Be it as it may, it remains a point to note that learners with low vision require more time to accomplish the curriculum designed for the primary cycle. It can be noted that if learners are allowed to open each term a week early and close a week later than regular schools, this can help to create more time that can be used to accomplish curriculum tasks. Cumulatively each year, duration of six weeks can be created to accomplish curriculum tasks. Lack of prescriptive spectacles was another challenge that 38% of learners with low vision experienced.

Zimmerman (1996) noted that a variety of lenses have been developed for use as optical devices, such as microscopes, binoculars, and monoculars. Spherical lenses have two curved sides or one curved side one flat side. A lens that bulges outwards is known as a convex lens. If it bulges both sides it is a biconvex lens, while if it bulges on one side it is called *Plano* convex lens. Convex lenses are thicker at the centre and are used for converging light or correction for hypermetropia because it converges light rays before they enter into the eyes (Corn & Koenig, 1996). If a learner views through the edges of a convex lens, the images will be distorted and also cause visual fatigue. It therefore calls for specialist teachers who understand the behaviour of light as it passes through the lens to be charged with the responsibility of training learners with low vision to learn how to function with spectacles. Koenig & Holbrook (1995) noted that if learners do not learn to use low vision devices properly, learners will develop visual fatigue and therefore will dislike use of the spectacle device for performing visual tasks.

The inverse of convex lenses are concave lenses, concave lenses bulge inwards and are used to diverge light rays. A concave lens that bulges inward on one side and is flat on the other is called Plano-concave lens, while a concave lens that bulges inwards on both surfaces is termed as a bi-concave lens.

A concave lens is used to correct myopia. It would therefore appear that learners go through life seeing images that are out of focus because their visual refractive errors have not been addressed. As a rule of thumb, all learners who may be having refractive errors that have not been correct must have them corrected so that they can begin seeing images that are focused. By extension corrected refractive errors will eliminate diplopia and visual fatigue and therefore the learners with low vision will be able to take a longer time doing visual tasks without fatigue setting in.

Another challenge that was pointed out was lack of reading/writing stands. Writing stands are non-optical devices that move visual tasks closer to the eyes so that the visual tasks can be at the correct visual sphere and/or distance for the tasks to be regarded appropriately, and also reduce muscle tone fatigue. Koenig & Holbrook (1995) argues that without reading/writing stands, learners with low vision develop poor posture due to close working distance, and that they tire readily thus may not complete visual tasks without getting fatigued. It is suggested here that for learners to improve on their comfortability, they need equipment such as reading/writing stands that can improve on their ergonomics. From the observation the researcher made, there was no reading/writing stands in any of the classes visited. It would seem that learners with low vision tire quickly when performing visual tasks because they have to bend so close to the visual tasks leading to both visual and muscle tone fatigue (Wilkinson, 1996). Head teachers should use carpenters found locally within their school environments to make the reading/writing stands. If the stands are availed to the learners then they will improve on their ergonomy and take a longer duration in performing visual tasks.

Another challenge that was indicated was scanning with low vision devices. (46.15%) of the respondents indicated that there were difficulties of scanning. This observation was consistent with what Jose (1985), noted that magnifiers must be held at their correct focal points which make users to hold the aid at very close working distance. Such close working distances cause fatigue. The fact that learners must move the low vision devices and at the same time scan with their heads not eyes can slow them down when performing visual tasks. The double movement of the low vision devices and user's head, results in skipping print lines and/or words. Because of the procedure involved, learners tend to find it difficult to read and write with a low vision device. It is important to note that the low vision devices take a lot of time for training learners to begin using them to the learner's benefits.

Lack of low vision devices (magnifiers) and lack of equipment to control the amount of natural light that fall on visual tasks while doing visual activities within the classroom were further challenges that learners experienced during classroom interaction. What these two findings point at are about unavailability of resources within the learning environments. Task specific learning resources must be provided for, in order for low vision learners to optimally use their vision. The equipment also improved the learner's ergonomics and duration of staying at visual tasks without tiring and/or losing interest in the visual tasks at hand. Controlled illumination is very important for learners with albinism and central scotomas who by nature of their visual impairments require less illumination on their visual tasks (Marshall, 1979).

Poorly built classrooms were another challenge that (41.02%) of respondents said was a major challenge. Corn (1985) observed that environmental medication can greatly improve on functioning of learners with low vision. Most classrooms that the researcher visited had been originally designed for learners who were totally blind. Some windows were not large enough to allow in adequate natural illumination for individuals who may be suffering from optic atrophy, and peripheral visual losses. Learners with such visual conditions need more illumination in order to visually function optimally (Marshall, 1979). Classrooms with poor décor may also be termed poorly built because if the visual tasks tend to have low contrast with the walls, a learner's visual functioning will be reduced. Because of the poor visibility, learners may fail to have good contrast thus leading to reduced visual functioning and reduction in visual output.

Teachers were asked to state problems they experienced when they worked with learners during the learning process. Their responses are presented in Table 6.

n=65

Problems	No. of Responses	%
Lack of training of using devices/adaptation of learning materials	16	24.61
Slowed speed of reading/being unable seeing materials for reading	6	9.23
Lack of appropriate print size books	3	4.61
Too much assignment that could not be completed	2	3.07
Deterioration of vision/eyes that do not see whole words/reduced visibility	12	18.46
Negative attitude from peers and significant others	2	3.07
Low vision devices that focused only on a small area of print at a time	8	12.30
Difficulties of tracking words/letter with low vision devices	9	13.84
Inappropriate books/crowded diagrams	20	30.76

Table 6: Problems Experienced by Teachers when Teaching Learners

Twenty teachers (30.76%) indicated that print size used in course books was inappropriate, and also that text had crowded diagrams that were difficult to see. Sixteen teachers, (24.64%) said that they lacked training and/or adaptations that can make them to access curriculum content. Twelve (18.46%) of teachers said that they had problems of learners who have eyes still deteriorated and as such, could not see whole words because of reduced visibility. Nine, (13.84%) of the teachers observed that they had difficulties of tracking the word/letters using low vision devices. Eight (12.30%) of the teachers said low vision devices only focused on small areas of print at a time. Six (9.23%) of the teachers noted that they had problems because of slowed speed of reading/writing due to not being able to see materials that were presented for reading. Three (4.61%) of the teachers observed that they lacked materials like large print books and low vision devices. Two teachers (3.07%) reported that they experienced negative attitudes when learners used low vision devices. Two teachers (3.07%) noted that learners did not complete given assignments.

Jose (1985) observed that when localization is done with a low vision device, the learner may exhibit erratic eye and head movements, verbalize the inability to see anything, held hand-held magnifiers too far from the eye, and also move the head or target too quickly. When such happens, the learner with low vision functions at frustration level and thus makes minimal progress at both reading and writing activities.

Buying and/or replacing lost or broken devices are a major challenge that faced improvement of learners with low vision during curriculum discourse. The researcher visited several classes in schools where data was collected, and it appeared as if learners with low vision were not encouraged to improve on their visual efficiency by making use of low vision devices, because when the devices got lost or broken they were not replaced. Wilkinson (1996) and Zimmerman (1996) pointed out that the use of optical devices can enhance the self-concept and self-esteem of persons with low vision in many ways. Among the benefits of using low vision devices are:

- ✓ A sense of independence when one can gain access to regular print in the environment without being dependent on others.
- ✓ A sense of competence because one has some control over visual environment.
- ✓ Greater pleasure from visual environment.

When learners with low vision have to make do without assistive devices, the learner generally do not control their visual environments, and may have minimal interest for acquiring information from print materials within and without the classroom.

IV. SUMMARY, CONCLUSIONS AND RECOMMENDATIONS

SUMMARY OF FINDINGS

When it came to challenges learners with low vision experience during curriculum interaction, it occurred that difficulties of writing on straight lines in their exercise books were noted to be a common challenge (82.05%). Reading crowded diagrams was also identified as a major challenge when learners were expected to read and interpret information from diagrams. Lack of large print books that can improve on learners' retinal spread was another challenge (76.92% of the respondents said so). Learners also faced a challenge of tiring quickly when performing near tasks like reading and writing. For such learners, seat work should be interspersed with short tests for learners to recover. It also came out that low vision learners need more time to cover curriculum content of specific classes. This may have been observed so because low vision learners take time to complete tasks thus creation of more time for learners to go through curriculum content was advocated for, however the learner will fell different from regular learners. One way to overcome such a challenge is to start each term one week earlier and end one week later than the regular school. Such an arrangement can create six weeks in a year for learners to cover curriculum content.

CONCLUSIONS

CHALLENGES POSED BY LOW VISION DEVICES

Learners with low vision face many challenges when performing visual tasks with devices. Among the challenges learners face included: difficulties of writing on a straight line, lack of large print books, learners tire quickly, difficulties in reading crowded diagrams from course books, and lack of reading materials like newspapers in large print. Learners also faced challenges of scanning with low vision devices, and curriculum content that is too wide to be covered within the stipulated time.

RECOMMENDATIONS

Learners with low vision experience several challenges when reading and/or writing with low vision devices. Consistent use and encouragement from teachers will make learners to maximize on the use of low vision devices. Learners must intentively be taught how to focus low vision devices and to make sure that they do not hold them out of focus. Learners should be encouraged to use low vision devices across environments and make a point of cleaning them and storing them safely.

Lost low vision devices should be replaced in order to give the learners with low vision the learning support they required. Task specific low vision devices like task lighting should be bought for learners who need more illumination on their visual tasks. A small fee be charged to enable head teachers to buy the low vision devices that can improve on learners visual skills.

Schools should make use of local carpenters to make age appropriate reading/writing stands in order to improve on the learner's ergonomics.

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