NETAJI SUBHAS OPEN UNIVERSITY

B. Ed. Spl. Ed. (M.R./H.I./V.I.)-ODL

# INTERVENTION AND TEACHING STRATEGIES

C-14 (V.I)

# B. Ed. Spl. Ed. (M. R. / H. I. / V. I)-
# ODL Programme

## AREA - C

## C - 14 (V.I) : INTERVENTION AND TEACHING STRATEGIES

A COLLABORATIVE PROGRAMME OF
NETAJI SUBHAS OPEN UNIVERSITY
AND
REHABILITATION COUNCIL OF INDIA

**AREA - C**
**DISABILITY SPECIALIZATION**
**COURSE CODE - C-14 (V.I)**
**INTERVENTION AND TEACHING STRATEGIES**


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The Self Instructional Material (SIM) is prepared keeping conformity with the B.Ed.Spl. Edn.(MR/HI/VI) Programme as prepared and circulated by the Rehabilitation Council of India, New Delhi and adopted by NSOU on and from the 2015-2017 academic session.


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**Mohan Kumar Chattopadhyay**
Registrar

# Netaji Subhas Open University

## From the Vice-Chancellor's Desk

Dear Students, from this Academic Session (2015-17) the Curriculum and Course Structure of B. Ed.- Special Education have been thoroughly revised as per the stipulations which featured in the Memorandum of Understanding (MoU) between the Rehabilitation Council of India (RCI) and the National Council for Teacher Education (NCTE). The newly designed course structure and syllabus is comprehensive and futuristic has, therefore, been contextualized and adopted by NSOU from the present academic session, following the directives of the aforesaid national statutory authorities.

Consequent upon the introduction of new syllabus the revision of Self Instructional Material (SIM) becomes imperative. The new syllabus was circulated by RCI for introduction in the month of June, 2015 while the new session begins in the month of July. So the difficulties of preparing the SIMs within such a short time can easily be understood. However, the School of Education of NSOU took up the challenge and put the best minds together in preparing SIM without compromising the standard and quality of such an academic package. It required many rigorous steps before printing and circulation of the entire academic package to our dear learners. Every intervening step was meticulously and methodically followed for ensuring quality in such a time bound manner.

The SIMs are prepared by eminent subject experts and edited by the senior members of the faculty specializing in the discipline concerned. Printing of the SIMs has been done with utmost care and attention. Students are the primary beneficiaries of these materials so developed. Therefore, you must go through the contents seriously and take your queries, if any, to the Counselors during Personal Contact Programs (PCPs) for clarifications. In comparison to F2F mode, the onus is on the learners in the ODL mode. So please change your mind accordingly and shrug off your old mindset of teacher dependence and spoon feeding habits immediately.

I would further urge you to go for other Open Educational Resources (OERs) - available on websites, for better understanding and gaining comprehensive mastery over the subject. From this year NSOU is also providing ICT enabled support services to the students enrolled under this University. So, in addition to the printed SIMs, the e-contents are also provided to the students to facilitate the usage and ensure more flexibility at the user end. The other ICT based support systems will be there for the benefit of the learners.

So please make the most of it and do your best in the examinations. However, any suggestion or constructive criticism regarding the SIMs and its improvement is welcome. 1 must acknowledge the contribution of all the content writers, editors and background minds at the SoE, NSOU for their respective efforts, expertise and hard work in producing the SIMs within a very short time.

**Professor (Dr.) Subha Sankar Sarkar**
Vice-Chancellor, NSOU

# B. Ed. Spl. Ed (M. R. / H. I. / V. I)-
# ODL Programme

## AREA - C

## C-14 (V.I.) : INTERVENTION AND TEACHING STRATEGIES

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Netaji Subhas Open University

**AREA - C**

**C-14 (V.I) : INTERVENTION AND TEACHING STRATEGIES**

## C-14 (V.I) ❐ INTERVENTION AND TEACHING STRATEGIES


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# Unit-1 ❑ Theoretical Perspectives

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## 1.1 Introduction

Blindness is a disability caused by absence of sight. It is well known that more than 80% of knowledge about the world is gained through the sense of sight. And 95% knowledg is received through vision and hearing. This means that those who can't

see are deprived of the opportunity of gaining this knowledge. It is considered to be a myth as many people in the absence of sight have acquired a great degree of success in all spheres of human learning. But to test this success, an additional effort is required. Information can be gained several ways and many a time we can learn one thing in more than one ways. What is needed is that a teacher teaching children with visual impairment should acquire an understanding of providing visual concept into accessible experiences, strengths and limitation of various senses and principle of teaching the visually impaired children. An attempt in this lesson also has been made to discuss implication of blindness and theoretical perspectives of visual impairment.

## 1.2 Objectives

After studying this unit students will be able to :

- State the meaning of methods, approaches and strategies.
- Explain the methods, approaches and strategies.
- State the concept and meaning of intervention.
- Explain the importance of interventions.
- Narrate the role of special teacher or special educators for lately blinded students in their intervention programmes.
- Explain the concept, need and procedure of mediated teaching learning.
- Describe the concept of development for visually impaired students.
- Explain the process of converting visual concepts into accessible experiences.

## 1.3 Difference among methods, approaches, and strategies.

**Meaning of Method:** The mode or role of accomplishing an end, in other words the orderly procedure of achieving the desired objectives. Teaching method is a procedure which a teacher follows to make learning interesting, easy and effective. It is the process of planning, guiding, sharing and evaluating learning with a group of students. It is an orderly way of doing something. It is the logical and systematized organized way of doing a thing for effective control. It is an effective procedure of using experience. Ex: lecture method, source method, project method, discussion method

etc.

**Teaching Approach:** The accesses or the means of access to the objectives. An approach is a theory about language learning or even a philosophy of how people learn in general. They can be psychologically focused such as behaviorism or cognitivism.

Approaches are fuzzy and hard to define because they are broad in nature. An example of an approach that leads to a method would be the philosophies of scholasticism, faculty of psychology. Ex: correlation approach, coordination approach, integrated approach etc.

**Teaching Strategies:** The plans for achieving the objectives. In achieving our objectives ( i,c., the teaching of visually impaired children), we should first determine the appropriate and suitable procedure of teaching. But there are many ways of awareness to arrive at the proper teaching procedures. It involves elaborate planning.

Stone and Morris have defined teaching strategy in the following words: "Teaching strategy is a generalized plan for a lesson which includes structure, instructional objectives and an outline of planned tactics, necessary to implement the strategy", Ex: story telling teaching strategy, narration teaching strategy etc.

### 1.3.1 Teaching Method

A good method of teaching is based on multi-sensory approach, whether teaching disabled children or non-disabled children. While teaching, the teacher should bear in mind that children with disabilities have reduction in the range and variety of some learning experiences due to their disabilities. However, they should also have the conviction that such reduced experiences can be compensated through effective methods of teaching. In order to facilitate effective teaching-learning process, curricular adaptations are imperative. These are important for developing proper conceptualleaming too by children with disabilities.

As inclusive education is one of the most viable options to increase educational opportunities for persons with disabilities, a thorough curricular adaptation is needed for creating better learning environment. As far as possible, the curriculum need not be changed for disabled children since it would work as a criterion for segregation. Adaptations in terms of methods of presentation, display, content, etc., may be necessary to enhance the learning experiences of these children. This approach not only helps children with disabilities, but also helps the teacher to assist children who have learning problems. The National Institute of Open Schooling (NIOS) has

completed a major exercise of adapting secondary education curriculum for the benefit of blind children and such an exercise can be undertaken for other categories of disabilities wherever necessary. This would improve secondary educational opportunities for all disabled children. Curricular adaptations are mostly suggested for visually impaired children who need non-visual experiences. In adaptation of learning materials for the use of children with disabilities, it is vital to see to what extent the information provided is creating a near normal experience to them. Therefore, adaptation work should be done carefully taking into account the learning style as well as the capacity of the disabled child. In a text material, it is vital to break them into different sub-units and analyze each sub-unit and classify the items, which are visual oriented, and which are non-visual oriented. Further to this analysis, it is essential to indicate as to under what cognitive level the learning tasks fall so that the teacher can design appropriate strategies for the learning of the child. The cognitive tasks may be categorized as knowledge, understanding, application, analytic, synthetic, and evaluation tasks.

Children with disabilities do not require a separate method of teaching. A good classroom teacher is expected to use approaches which would enable all children to study effectively irrespective of their disability. Therefore, the inclusive education setting emphasizes curricular adaptations rather than prescribing a new curriculum.

**Some methods of teaching useful for children with disabilities are:**

**Play-way method of teaching:**

In this method the child is not kept in the classroom as a learner. The child is introduced the lesson through a number of play activities and in the process of such play, the teacher introduces specific concepts. Children who are learning through play-way method experience a sense of discovery.

**Providing concrete experiences:**

Children learn in three developmental stages. Firstly, they need concrete experiences involving three dimensional objects etc. Secondly they can learn through pictorial ideas, and thirdly they develop abstraction. As far as children with disabilities are concerned, providing concrete learning experiences becomes pertinent. A strong foundation developed through concrete experiences will help them to understand the higher order experiences, including that of, abstraction without much difficulties.

**Teaching in a step by-step way:**

Due to the loss of a specific faculty, children with disabilities are bound to loose the

sequence of learning experiences. They often experience mediated learning and as a result, they need well-defined learning strategies. Teaching in a step by step sequence becomes vital for children with disabilities. Though this type of incremental approach is helping all children, children with disabilities are very much benefited by this. They are able to overcome the loss of learning experiences which are forced by the absence of the senses, when teaching is done in a step-by-step way.

**Modifying method of teaching to suit the individual learning styles of disabled children:**

The teacher should ascertain whether the child is a visual learner or an auditory learner or a tactile learner for designing proper instructional strategies. Though classification of this kind is imperative in the general classroom too, its application with children with disabilities is of paramount importance because these children exhibit different skills at different levels.

**Facilitating learning by involving children with disabilities in groups:**

Cooperative learning approach is considered to be an effective teaching-learning process in the classroom especially when the class has children of different abilities. In a class consisting of children with disabilities, group learning can be planned by involving a child with disability in a group consisting of non-disabled children. This kind of activity not only develops the academic skills but also influences social integration of the child.

**Teacher assisted peer-group learning:**

Peer group learning is considered to contribute to effective learning in the case of non-disabled children and it is not less so in the case of disabled children. For adopting peer-group learning, a lot of preparation on the part of the teacher is needed. Activities for peer group learning, strategies for intervention, etc., are to be thoroughly planned by the teacher. A teacher in this process can become the facilitator of information sharing and see that the children (including disabled children) study in a harmonious way.

**Learning through field-trips and first hand experience:**

Since children with disability experience reduction in the range and variety of experiences in many aspects, they have to be compensated by alternative modes of information. Field trips are such alternative source of experiences which mostly contribute to the proper concept development of these children.

**Use of supplementary teaching aids and appliances for developing appropriate concepts:**

As already indicated, concept development is vital tor the disabled child to understand academic as well as non-academic areas. Sometimes a concept taught by the teacher using the normal mode of information may not be appropriate for the child with disability to understand. Therefore, it is essential to use additional teaching aids which may provide the needed concept development in the child. The supplementary teaching aids should not be considered as additional burden. In fact these are to be treated as essential for providing the substituted learning experiences to children with disabilities.

**Criterion based teaching as well as evaluation techniques:**

Usually evaluation in a regular classroom is norm based. The teacher makes an evaluation of the child on the basis of quantitative scores. However, this type of evaluation may not be proper for all activities in the case of children with disabilities. Since disabled children have to learn curricular as well as expanded co-curricular activities, mastery of the child over certain skills are more important than comparing the child with another child. Therefore, criterion based evaluation is appropriate, which will help to see the position of the child at various points of time. In criterion based evaluation, there is no pressure of comparative performance and therefore, the child can learn in a natural way.

When the above aspects are addressed by the regular classroom teacher, teaching of any subject would become easier for the disabled child to understand. The methods described in this chapter are applicable to children with visual impairment. Therefore, practice oriented teaching approach would enhance the learning efficiencies of disabled children.

### 1.3.2 What are the approaches to learning

Approaches means the awareness or the means of assessing the objectives. An approach is a way of looking at teaching and learning.

- Approaches to learning are deliberate strategies, skills and attitudes that permeate the teaching and learning environment. It supports the learner's belief that a large influence on a student's education is not only what you learn but also how you learn.
- Teaching students how to learn has always been a part of teaching, but now the

special education is providing more explicit support for teaching these skills, aligning the Bachelor of special education and the career-related programme for visually impaired students.

- Focus on approaches to learning will improve the quality of teaching and learning across the programmes and may result in more engaged teachers and students.

**Clarity of instruction**

Instructional clarity has two components: cognitive clarity and oral clarity A link between teacher clarity and student achievement and satisfaction was identified by Hines, Cruickshank and Kennedy (1985). They identified 12 behaviours that contribute to instructional clarity:

1. using relevant examples during explanation
2. reviewing material
3. asking questions to find out ifstudents understood
4. answering student questions appropriately
5. repeating things when students did not understand
6. teaching in a step-by-step manner
7. providing students with sufficient examples of how to do the work
8. providing time for practice
9. teaching the lesson at a pace appropriate to students
10. explaining things and then stopping so that students could think about it
11. informing students of lesson objectives or what they were expected to be able to do on completion of instruction
12. presenting the lesson in a logical manner.

**Clarity involves:**

- knowing the subject matter
- being able to see the information from a leamer's perspective, and
- the ability to explain things in simple terms.

### 1.3.3. Strategies for teaching students with visual impairment

There are two main functional categories of visual impairments: Low Vision and Blind. Low vision students usually are print users, but may require special equipment and materials. The definition of legal blindness covers a broad spectrum of visual impairments. The extent of visual disability depends upon the physical sensory impairment of the student's eyes, the age of the student at the onset of vision impairment, and the way in which that impairment occurred. Vision also may fluctuate or may be influenced by factors such as inappropriate lighting, light glare, or fatigue. Hence, there is no "typical" vision impaired student. The major challenge facing visually impaired students in the science educational environment is the overwhelming mass of visual material to which they are continually exposed viz., textbooks, class outlines, class schedules, chalkboards writing, etc. In addition, the increase in the use of films, videotapes, computers, laser disks, and television adds to the volume of visual material to which they have only limited access. To assist in overcoming a students' visual limitation requires unique and individual strategies based on that student's particular visual impairment and his/her skill of communication (e.g., Braille, speed listening, etc.).

**General information for teaching strategies:**

- Speak to the class upon entering and leaving the room or site.
- Call the student with visual impairment by name if you want hislher attention.
- Seat the student away from glaring lights (e.g. by the window) and preferably in front of the class.
- Use descriptive words such as straight, forward, left, etc. in relation to the student's body orientation. Be specific in directions and avoid the use of vague terms with unusable information, such as "overthere", "here", "this", etc.
- Describe, in detail, pertinent visual occurrences of the learning activities.
- Describe and tactually familiarize the student to the classroom, laboratory, equipment, supplies, materials, field sites, etc.
- Give verbal notice of room changes, special meetings, or assignments.
- Offer to read written information for a person with visual impairment, when appropriate.
- Order the appropriate text books for the students in their preferred medium.

- Identify yourself by name; don't assume that the student who is visually impaired will recognize you by your voice even though you have met before.
- If you are asked to guide a student with visual impairment, identify yourself, offer your services and, if accepted, offer your arm to the student's hand. Tell them if they have to step up or step down, let them know if the door is to their left or right, and warn them of possible hazards.
- Orally, let the student know if you need to move or leave or need to end a conversation.
- If a student with visual impairment is in class, routinely check the instructional environment to be sure it is adequate and ready for use.
- When communicating with a student who has visual impairment, always identify yourself and others who are present.
- Be understanding of the little noise made by a portable translator.
- Also use an auditory or tactile signal where a visual signal is normally used.
- It is not necessary to speak loudly to people with visual impairment.
- Always notify changes of class schedule in advance.

**Teacher Presentation**

- By verbally spelling out a new or technical word, you will be helping the student with visual impairment, as well as for other students.
- An enlarged activity script, directions, or readings of a detailed lesson can be used for a low vision person and for use in describing tactile 3D models.
- Use an overhead projector to show step-by-step instructions. Mask all the instructions except the one(s) that you want to present.
- Use an opaque projector whenever possible to enlarge a text or manual.
- All coloured objects used for identification related to a lesson, experiment, or other directions should be labeled with a Bratlle label maker or otherwise tacitly coded for most students WIth vision impairment.
- Describe, in detail, visual occurrences, visual media, and directions including all pertinent aspects that involve sight.
- Use a sighted narrator or descriptive video (preferably the latter) to describe aspects of videos or laser disks.

- Describe, in detail, all pertinent visual occurrences or chalkboard writing.
- Where needed, have lesson or direction materials. Brailled, use an enlarged activity script, or recorded ahead of time, for class handouts.
- Have tactile 3D models, raised line drawings, or thermoforms available to supplement drawings or graphics in a tactile format when needed.
- Whenever possible, use actual objects for three dimensional representations.
- Modify instructions for auditory/tactile presentation.
- Use raised line drawings for temporary tactile presentations.
- Use an overhead projector, chalkboard, graphs, or slides as you would normally, but provide more detailed oral descriptions, possibly supplemented with thermoforms where appropriate.
- Allow student to use a tape recorder for recording classroom presentations or the text.
- Make all handouts and assignments available in an appropriate form: e.g., regular print, large print, Braille, or on a cassette, depending on the students optimal mode of communication.
- Use a monocular or a private eye (electronic miniature television) or similar devices for long range observations of chalk board or demonstration table presentations.

**Text Reading Systems**

- Paid or volunteer readers or writers can assist a student with visual impairment with texts, materials, and library readings.
- Offer to read, or arrange to have read, written information for a person with visual impairment, when appropriate.
- Arrange, ahead of time, for audio book acquisition of the text or other reading materials through the Talking Book Service, Recordings for the Blind, text reading systems, or audio output devices.
- Various Braille devices can be used to assist vision impaired students when reading.

**Assessments:**

- Make arrangements for tactile examinations.
- Place the student being tested close to the activity if tactile examination is necessary.
- Present examinations in a form that will be unbiased to visually impaired students. Ask the student for the approach he/she finds to be most accessible.
- One possible accessible method is to record test questions on tape and have the students record their answers on tape in an area which has minimal disturbance for other students.
- Use an enlarged activity script, directions, or readings to go along with the testing material.
- Allow more time.
- Allow calculators to be used during the test.
- Make use of larger print (e.g. 14 pt; 20 pt sized or as needed).
- Make use of visual magnification (magnifier or magnifying machine), audiocassette, Braille / Braille graphs / Braille device for written responses, large block answer sheet.

**Difference between method and approach:**

| Method | Approach |
|---|---|
| 1. Method is—how to teach. | 1. Approach is—what to teach. |
| 2. Method is—where teachers' activities are emphasized. | 2. Approach is—where stresses are on pupil's activities. |
| 3. Method is—where many items may be taught at a time. | 3. Approach is—only one item is taught a time. |
| 4. Method is suited for seminar classes. | 4. Approach is—not suited for senior classes rather it is fit for primary classes. |
| 5. Method is—not situational. | 5. Approach is—situational. |

**Difference between teaching method and teaching strategy:**

- Teaching method is a macro approach, where as teaching strategy is a micro approach.
- Teaching method considers teaching as an art, where teaching strategy considers teaching as science.
- The purpose of teaching method is effective presentation of the subject matter, where teaching strategy is to create conducive learning environment in the class.
- Teaching method is based in the classical theory of human organization, where teaching strategy is based on modern theory of human organization.
- Work is important in methods, where strategies of teaching behaviour of teachers and students and their mutual relationship are important.

## 1.4 Interventions

**Intervention:** A visually impaired child faces developmental and psychosocial difficulties in life. The parents, teachers/educators (or the society at large) have to understand the problems and help him/her to cope with those deficits, the help should be extended as soon as the problems/difficulties are noticed. This is called early intervention.

Here intervention means understanding of the nature of the problems of visual disabilities, its social and psychological implications and training. It is to be remembered that intervention may be medical, educational, social and psychological.

### 1.4.1 Early Intervention

**Definition:** The term early intervention refers to services given to very young children with special needs, generally from birth until the child turns six.

Early Intervention Services are special services for infants and toddlers at risk for developmental delays. These services are designed to identify and meet children's needs in five developmental areas. These are physical, cognitive, communication, social, or emotional development. Early intervention includes provision of services

to such children and their families for the purpose of lessening the effects of the condition.

Early intervention programme may be centre based, home based, hospital based or a combination of all.

**Importance of Early Intervention:** There are three primary importances for intervening early with an exceptional child:

1. To enhance the child's development,
2. To provide support and assistance to the family and
3. To maximize the child's and family's benefit to society.

**Aims of Early Intervention Programmes :**

1. Early identification of infants at risk
2. Early identification of developmental delays
3. Enhancement of normal development
4. Acceleration of rate of development
5. Acquisition of new behaviour or skills
6. Increase in independent functioning
7. Early detection and prevention of secondary handicaps
8. Minimizing the effects of the handicapping condition
9. Cost effectiveness
10. Psychological support to families

**Steps involved in this process:**

- Identification
- Intervention
- Rehabilitation

**1.4.2 Early Identification:** Early identification of the child with visual impairment helPta a great deal in facilitating effective rehabilitation of the child. Some of the techniques for early identification of children with visual impairment are as follows.

- Eye Hospital
- Eye camps
- Population centers
- Through anganwadi workers
- Voluntary organization

### 1.4.3 Classification of Intervention Programmes:

Current practice of early intervention is viewed as a deficit model. The time to intervene is before the delay occurs; the goal is to prevent the delay, if possible.

Early intervention programmes are classified as vision screening, medical intervention and educational intervention. All these programmes go simultaneously for prevention of eye deficit, restoration of vision, development of vision efficiency.

**Vision Screening:** All children should be screened for possible vision problems, especially those under the age of three with a suspected or identified risk factor, regardless of severity. The initial screening should be conducted by trained personnel on vision screening procedures. The trained personnel may be low vision specialist, special teacher, rehabilitation workers and village nurses.

Identified cases of visual problems are referred to the medical personnel who would attend to thorough eye examination.

**Medical Intervention:** There are many possible defects or diseases of the visual system, but, fortunately, many of them appear after the first few years of life. There are still many malformations, defects, diseases, infections and disorders that can affect the visual system in infants and toddlers. As it is presumed that medical follow up to screening will identify and prescribe treatment. The medical professionals will take care of the treatment aspects for the diseases and defects of the eyes. After the medical treatment still the child may have visual defect, further intervention programme should be planned for the restoration of remaining sight and development of visual efficiency. Through medical intervention, diagnosis, eye treatment, eye surgeries and provision of glasses and low vision aids are done for the curable visually impaired. For incurable visually impaired persons, identification, eye check up certification of visual impairment and counseling are done by the medical experts. These incurable visually impaired persons are referred to the rehabilitation centers for further services

**Educational Intervention:** Educational intervention includes the preschool training

such as development of daily living skills, mobility skills, visual skills, etc. and placement of the child into the formal school system. The trained teacher or rehabilitation worker who qualified on visual impairment takes the child with visual impairment for training on various skills required by the child. He develops the pre educational skills such as tactile discrimination, other sensory development, communication skills mobility, social interaction etc. All these training will be helpful for making appropriate placement of the child in the educational programme

**Vocational Intervention**

Vocational training is an important component of the vocational intervention. There are some disabled individuals who, after they are provided with physical restoration services, are capable of going back to their old jobs. But, there are unfortunately many, who are unable to do so, and, therefore, require training in new skills. Vocational training may not be so essential to an able bodied person, who can benefit by general education. Vocational training assists persons who are blind in preparing for, obtaining, and retaining employment. Applicants are made eligible based on their visual disability, their need for vocational training, and their intent to work. The vocational training counselor and the eligible individual work in partnership to jointly identify a realistic employment objective consistent with the individuals skills, abilities, capabilities, aptitude, particular interests, concerns and resources through informed choice, as well as the services needed to achieve that objective.

Factors to be considered in determining a disabled person's suitability for vocational training:

- He must have the necessary level of intelligence, educational background, work experience or potential aptitude to be able to derive benefit from the particular course.
- He must have the capacity to match up to the physical requirements of the actual trade.
- He must have the interest, determination and necessary adaptability to absorb training and make good in a new occupation
- He must have reasonable prospects of placement in the trade on completion of training

**Steps involved in Vocational Training**

- Help disabled persons gain or recover working habits
- Give help and guidance on social problems which may be impeding resettlement.

- Providing physical reconditioning where necessary.
- Provide medical, psychological, and vocational assessment of capacity to work in particular types of jobs.
- Build up or restore morale and self-confidence
- Arrange for vocational training of the rehabilitee
- Find suitable employment for the individual

**Rehabilitation**

Rehabilitation centers for the visualy impaired are run by government and non government organizations in several places of the state.

The persons with visual impairment are referred to those centers which are nearer to the clients for getting service.

The rehabilitation centers are taking care of visually impaired persons in the following ways:

1. Identification and diagnosis of visual defectiveness
2. Arranging treatment and follow up for restoring vision
3. Obtaining certificate of visual impairment
4. Individual assessment - visual and functional
5. Individual counselling and family counselling
6. Provision of training in :

- Orientation and mobility
- Activities of daily living etc.
- Social integration
- Education
- Economic rehabilitation
- Support services and obtaining concessions
- Bringing community awareness and involvement

## 1.5 Intervention for lately blinded students - Role of special educators or special teacher for lately blinded students.

The teacher of students with visual impairment is the central figure on the educational team for lately blinded student. He is the professional who has expertise in how visual impairment affects the child development and learning, as well as the strategies and tools that can help the child learn about the world, perform everyday activities and participate in the general curriculum and other activities in school. Therefore, the child is likely to be working with the teacher of lately blinded students on day to day basis. He or she will probably serve as the coordinator of the educational team and as a resource for the other team members.

Teachers of students with visual impairments provide guidance and counselling to youth with visual impairments and their families to:

- Interpret implications of visual impairment for overall development.
- Facilitate understanding of society's attitudes concerning visual impairment and to assist students and families to formulate their responses to misconceptions, lowered expectations, and prejudice.
- Explore similarities and differences in relation to all children.
- Develop social awareness of self, others, and the community at large.
- Encourage social interactions with peer groups.
- Identify functional, academic, and vocational potential.
- Encourage home involvement in programme objectives.
- Promote independence in infants, children, and youth with visual impairment.
- Plan for adult life by exploring options for college, technical or trade school, job coaching programmes, industrial enclaves, and other post-secondary placements, as well as identifying independent living arrangements in the community.
- Refer to other sources for additional guidance and counselling services.

The specific responsibilities of the teachers of student with visual impairments with the child may vary, depending on the child age and needs, the goals his educational team sets for him, the type of educational programme the child participates in, and the policies of the particular school.

The role of the teacher and special educators of the students with lately blinded may include some or all the followings.

- Conducting various assessments of the lately blinded children to determine his abilities and needs.
- Meeting with family members, regular class teacher and other member of the educational team to discuss his progress and make suggestions for trategies to make his school work accessible and to include late blind student to the greatest extent possible in all school classroom, and extracurricular activities.
- Making referrals for additional service to the child may be needed, such as for orientation and mobility instruction.
- Preparing or obtaining of leaming materials, text books, and examinations in the appropriate assessable format for lately blind student such as Braille, large print, audio materials, electronics materials.
- Analyzing the classroom and the other environments for access and safety related to students lately blinded students and advising other members of the team about how best to organize the classroom and materials.
- Providing consultation and training for teachers Para educators and other school personnel on effective strategies for teaching students with lately blind students.
- Consult with the classroom teacher on ways of making the general curriculum accessible to the impaired child.
- Creating a classroom climate that is compatible for all students.
- Be responsible for preparing classroom materials in formats that are accessible to the child.

The teacher of students with visual impairments, depending on the model(s) of service being utilized (residential school, special class, resource room, itinerant, or teacher consultant) has a variety of administrative roles. In a large programme, this may include supervision of other teachers of students with visual impairment, in addition to working with Directors of Special Education, principals, regular classroom teachers, and other educational and related services personnel.

**Some of the most common activities in this area may include:**

**Communication with Administrators:**
Teachers of students with visual impairment keep administrators informed concerning:

- ✓ Student information (e.g., visual status, grade level, prototype).
- ✓ Programme goals and activities.
- ✓ Programme evaluation.
- ✓ Screening and referral procedures.
- ✓ Relationships between the programme for students with visual impairment and regular and special education programmes and support services.
- ✓ Funding requirements for consultation, instruction, salaries, travel time, travel expenses, instructional materials, preparation time, conferences, and benefits .
- ✓ In-service needs for teachers and consultants of students with visual impairments, as well as for other regular and special education personnel.
- ✓ Staff scheduling requirements, including adequate time for planning, preparation, report writing, travel, direct instruction, team meetings, and staff conferences.
- ✓ Physical facilities, including design and selection of classroom environments and office space, as well as adequate storage space for instructional materials and equipment.
- ✓ Student scheduling, including preparation of a master schedule to be given to the supervisor and principal(s) ofthe building(s) in which students are served.
- ✓ Equipment needs, particularly in the area of technology, but also including materials and technological devices.

**Record Keeping**

- ✓ Maintain records of student assessments, IEPs, IFSPs (and other planning documents), periodic reviews, progress reports, and signed parental release forms .
- ✓ Maintain material and equipment requests .
- ✓ Exchange information about students with visual impairments with appropriate personnel following school district or agency policies regarding confidentiality.

**Case Finding and Student Referral Procedures**

- ✓ Act as a vision consultant for system-wide screening, materials, follow-up and recommendations .
- ✓ Participate in school district's annual Child Find programme .
- ✓ Maintain a referral/communication system with nurses and other school staff.

when a person becomes blind (be he/she is a child or an adult), he comes face to face with the tremendous task of acceptance of visual loss (i.e, blindness) and adjustment to the new situation. Apart from the parents, the teacher plays the role of a counsell more than that of an educator. He has to consider the age of on-set of blindness, the degree of loss of vision. The persons social positions (i.e. his relation with parents, siblings, neighbours, etc.) his educational status, his rehabilitation needs. The teacher is actually a mediator between the newly blinded person and the tasks to be learn/ to get adjusted to a non-visual world.

## 1.6 Mediated Teaching-learning

**Concept of Mediated teaching learning:**

Mediated learning is the subtle social interaction between teacher and learner in the enrichment of the students learning experience.

Needs of Mediated teaching learning:

i. Reflecting knowledge.

ii. Concept formation.

iii. Problem solving.

iv. Removal error concept.

v. Lack of text b~k andbraille book, large print book etc.

vi. Develope of social skills, creativity, self-confidence, co-operation, collaboration etc.

**Procedure of Mediated teaching learning:**

Three stages of mediated learning.

1. Before mediated teaching learning:

- Lesson planning: Identify lesson objectives and accommodate IEP goals, link to prior knowledge, plan for additional assistance with students with needs, determine groups earlier, and consider how students can have mores independent practice.
- Routines/ Expectation: establish rules, routines and arrangements with the students.
- Environment: classroom layout is important and students my need to be directed prior to the lesson to know what to do before they begin the lesson.

2 During mediated teaching learning:

- Discuss what the lesson will be about and what they are going to learn. Also want to link the information being learned to prior knowledge.
- Modeling, engagement, and guided practice done by the teachers and the students to grasp the key skills. Idea behind this is not to move on the independent practice until the students understand the skills. Set the students up for success.
- Give feedback through-out the lesson and give time for questions and active time to respond to teacher's questione. Give praise and positive reinforcement for efforts and positive behaviour movement.

3. After mediated teaching learning:

- Lesson summaries reflect back on what was learned.
- Checklists or "exist slips" with actions to organize work and materials remind students what to do accomplish the task.
- Signal of time frame left or when class is over remind students to start wrapping up their task.

**Mediator learning:**

Mediator learning is method of instruction develop by Dr. Reuvn Feuerstein. During mediated learning a mediator- a parent teacher, sibling or someone with a vested interest in the learners life provide a suitable stimulus (homework, test, assignment etc.) and then observe s the learners response to the stimulus.

Mediator learning experience refers to the way in which stimuli experience in the environment are transformed a mediating agent, usually parent, teacher, sibling or other interested person in the life of the learner.

The following process outlines the tasks involved in the teaching and learning process. It assumes a highly collaborative working relationship between the teacher and learner.

In the sense that it is used here, the word 'learning' refers to

a) the process of learning as used by the learner

b) and the learning (outcomes) achieved by the learner

In each step of the process both aspects of learning are considered.

It is important that the learner is aware of his/her learning achievements and the

processes that he/she used in order to make these achievements. In the process of (mediated) learning the learner is the active agent.

In less collaborative, more controlling teaching processes there is greater separation of functions, i.e., some of the tasks will be exclusively the responsibility of one party or the other. This tends to assume that the teacher is the active agent (contrary to most educational psychologists, including Piaget) and that the student is simply being processed in order to generate learning outcomes.

For example, in a course based teacher directed programme,

- the selection of focus and content will have occurred elsewhere and by others before the teaching and learning begin
- the checking on prior learning may be ignored or left entirely to the learner
- observation, recording & reflection may be exclusively done by the teacher independent of the learner and so on ...

Sight helps whole learning (Gestalt), while no visual persons learn part by part. It creates deficits in age-adequate experiences. To fill the gaps in his experience, he is to be helped in experiencing the visual ideas in his non-visual way. In childhood stage, concretization of experiences, as far as practicable is required. But in adolescence or in adulthood, he comes across move and more with abstract ideas, to understand which basic and proper concept formation is the master key.

The whole curriculum for children in school and community is centered around two significant aspects. "The opportunity" and "the experience". Often children are provided with opportunities but the mere provision of opportunities does not mean the acquisition of experience. The understanding of the self and the world is not a 'whole' when experience is denied.

The sighted children have an edge over visually impaired children in the acquisition of knowledge through experience. The vision, which brings an enormous amount of information in just a glimpse, enables sighted children to have rich experiences in a" NATURAL WAY". they learn the experiences as a "WHOLE". But the learning of visually impaired children is not" WHOLE" but in "PIECES" of information. Thus there is significant difference between the two groups, the sighted children having "NATURAL LEARNING" and visually impaired children having" MEDIATED LEARNING ". There is, therefore, a need for adaptation in curriculum for visually impaired children.

## 1. 7 Enriched teaching for concept development

Concept development is fundamental in the education of children with disabilities, particularly for those who are visually impaired children. Loss of one sense of the child adversely affects the concept development of these children. Though specific concept development areas are applicable for specific types of children with disabilities, some concept development areas are general. They include body awareness, object and situation characteristics, time and distance awareness, spatial awareness, measurements, orientation of environment, etc. These have to be consciously developed in the child.

As most of these concepts grow naturally in a non-disabled child, a disabled child living in the mainstreaming environment will be able to acquire these concepts in a natural way. Therefore, inclusive education setting is more conducive for the concept development of children with disabilities. Even in the special schools the children can be provided ample opportunities to develop their concept development skills.

**What is concept ?**

A concept is a mental image of some object, person or an idea. Concepts are formed by generalisations from particulars. Concepts are also formed due to the experience of the past, i.e. formation of new concepts are affected by the past experiences. Concept formation depends upon the ability of individuals to distinguish between objects so that they are classified as belonging or not belonging to a particular group of objects. Thus, a concept represents a class of stimuli, may be objects, animals or events. Thus, we have the concepts of 'table', 'chair', 'teacher', etc. According to Smith, "The process by which we organise and classify stimuli, by which we come to perceive sets of stimuli as unified wholes and by which we come to put a number of instance into one category such as 'Chair' is called concept formation or concept learning".

An individual goes on learning new concepts and using old concepts in new situations throughout his life. These concepts act as the basic units of learning. But, the individuals differ in their concept formation according to their age, intelligence, and experience. For example, a layman's concept about a thing would be radically different from that of an educated and experienced person. A concept in fact means what we understand by a thing. A child's or a layman's understanding of a thing will certainly be different from an intelligent person's understanding about that thing.

Initially, concepts about concrete objects are formed, and gradually concepts like 'truth', 'beauty', and 'justice' etc. are formed alongwith the intellectual development of the individual.

A concept is derived from the identification of common characteristics in an object, person or thought. As Munn describes, "A concept is a process which represents the similarities in diverse, objective, situtations or events".

Concepts are the basic units of learning and reasoning, and once developed, help further thinking:

Formation of Concepts

Concept formation undergoes two processes:

Generalisation.

Abstraction.

*Generalisation* means to strike similarities among objects, events, individuals, situations, etc. belonging to the same class. Take for example, a child's first experience with a cat. By and by he begins to differentiate between a cat and other domestic animals, and notes the common characteristics of a cat. Thus, he forms a concept about a cat. Similarly, other concepts develop through generalisations.

*Abstraction* is observing the similarities of otherwise different things, situations and ideas. Both abstraction and generalisation go side by side though abstraction requires higher mental processes. Generalisation is a process generally applicable to the formation of concepts about concrete objects, like table, chair, etc. Abstraction is applicable to the formation of concepts about abstract ideas like truth, beauty Justice, etc. and therefore, requires higher mental processes for their formation. Both abstraction and generalisation come from observation of similarities, in different situations having common characteristics.

Attributes of Concepts

Concepts have attributes and characteristics which each member of the concept class has in common. The main attributes are:

- Perceptibility.
- Learnability.
- Usability.
- Validity.

- Generality.

***Perceptibility:*** This means that perceptions lead to the formation of concepts. Firstly the things are observed and perceived. This perception gets mixed with the previous perceptions leading to the formation of new concepts.

***Learnability:*** Concept formation is the result of learning. They are the products of observation, experience and thinking. The teacher can help the studentls in the formation of correct and positive concepts. Concept formation is essential because concepts are the units and basis of learning and thinking. Correct and positive concepts help in the development of the personality of an individual.

***Usability:*** Concept formation depends upon usability or the freqeuncy of their use. That is why drill and practice are emphasized. Drill and practice help in fixing the concept in mind. Formulas and definitions should be over learnt to get them fixed in the mind.

***Validity:*** Validity means correctness. A concept is valid ifit has a clear cut and definite meaning. Generally, a man's experience and maturity help him to form valid and correct concept.

***Generality:*** Concepts are the result of generalisation. Observation and perception of common characteristics lead to generalisations, and consequently to the formation of concepts.

These are some of the main attributes or characteristics of concepts.

**Teaching and Learning of Concepts depends on:**

***Providing individual Instruction:***

On account of the psychological fact that there are marked individual differences, it is suggested that individualised instruction should be provided to the children. Individuals differ in their capacity of concept-formation. Individual with low intellectual level can form concepts about concrete objects only; on the other hand, children with high intellectual level can also form concepts about abstract terms and ideas. The teacher, therefore, has to provide individualised instruction accordingly.

***Providing Variety of Experiences:***

Concept formation is the result of observation and experience. Concepts are formed and made clear through experience and maturity. Therefore, it is essential that the

children be provided with large experiences.

***Presentation of Examples:***

Examples provide experiences which can be better and are easily understood. Concepts must be developed on the basis of perception, which are provided by concrete objects and examples.

***Using Inductive and Deductive Methods:***

Inductive method implies firstly, the presentation of examples and then the formulation of generalisation on the basis of examples. Deductive method, on the other hand, implies the testing and application of the generalisation. Both the methods may be used in combination for the effective and successful formation of concepts.

***Making use of Maxims of Teaching :***

For clear and correct formation of concepts, the teacher, should make use of the maxims like 'Proceed from simple to the complex' and 'Proceed from concrete to the abstract'. The use of maxims of teaching will make the learning of concepts easy.

***Active involvement of Students:***

The students should be made active participants in the learning of the concepts. This, independent learning should be encouraged on the part of the students. The students should be provided with learning situations, and they should be made to observe and generalise themsel ves. This is a surer and lasting way of learning.

***Adopting Integrated Approach to Learning:***

Experiences and units of learning should be presented to the children in an integrated form. The 'whole' is more easily understood by the children because analyse of the whole, into "parts demands greater maturity and intellect on the part of the children. A combination of the whole method and the part method will give excellent results, as far as the learning and formation of concepts is concerned.

***Making use of Audio- Visual Aids:***

Personal and direct observation and experience is the best way of learning anything. But, if these are not possible, then the teacher should make use of audio-visual aids for the clear and correct formation of concepts.

These are some of the effective ways of developing concepts.

***Uses of concepts***

***Concepts reduce the complexity of the environment-***

As we know, concepts always represent a class of stimuli, but not any particular stirnul us. If we respond to each individual stimulus, it will unnecessarily take more time and energy. Instead of responding to thousands of particular but similar stimuli, we respond to a concept which embraces all these stimuli and thereby it reduces the complexity of the environment. The learning of concepts enables the children to grasp, in an array of stimuli, similarities and difference which he would otherwise have great difficulty copying with. Education in this sense, gives the student environmental mastery which he would otherwise lack.

***Concepts help us to identify the objects arounds -***

Identification involves placing an object in a class and therefore, reducing the complexity of the world of stimuli. For example, sound is a general concept. But we are able to identify and discriminate various sounds like sound of bell, sound of different animals and birds, sound of different musical instruments.

***Concepts reduce the necessity of constant learning -***

Concepts always represent a class. Therefore, when we learn a particular concept, we are not required to learn the individual objects constantly. For example, once we learn what is a mammal and the characteristics of mammals, we are not required to continue the learning of the characteristics of each member of this class. We always prefer to develop a general characteristic which will be all inclusive.

***Concepts provide direction for instruction -***

By using concepts and principles we know in advance the action we can take. The steps described for the I

teaching of concepts and principles are largely embodied in a set of verbal instructions. These instructions would not be possible without the learning of concepts. Concepts and principles can stand as barriers to instruction and to the teacher when the student has an inadequate grasp of them and does not know their relationship to the concrete environment. Abstract and more difficult concepts make the process of instruction more complex and strenuous.

Concepts grow out of the perceptual process and become enriched as the child develops language. The breadth of concept development is dependent in large measure on the breadth of the perceptual experiences. Because the blind child lacks one source of sensory input, his perceptual processes are deficient. He may never grasp some concepts and may need more experience than the sighted child to grasp others. Abstractions such as a concept of color may never be formed, since the child has no

possibility of acquiring a background of sensory input for this concept. The concepts of distance and time illustrate another group which eventually mayor may not be grasped, depending on the variety and number of experiences designed to give them meaning. For example, the sighted child may acquire some meaningful concept of distance by visual input, that is, how far he can see, and later through an understanding of relative distances as shown on a map drawn to scale. While the blind child may reach some understanding of distance through his kinesthetic sense, he encounters difficulty in doing so. Walking a specific distance would be the most meaningful procedure, but a walk of sufficient length to give an idea of great distance would not be feasible. Further, his deficiency in grasping what distance is prevents his making maximum use of maps through his tactile sense in order to acquire a concept of relative distance. He needs many concrete experiences through his kinesthetic sense in order to use maps effectively.

Lack of vision limits their perception and cognition. This causes knowledge gap between sighted and the

children with visual impairment. The visually impaired child becomes aware of this world through senses other

than sight - this is, through the senses of hearing, touch and smell. In understanding the world around him he

cannot perceive objects as much as the sighted by dint of remaining senses either because of physical

inaccessibility or of social restraints, for example. Hills and Mountains, Space and relationship to one another

are abstract things to the visually impaired children. Most of those are. to be explained to the child orally or by the experiences to what they can hear, feel and manipulate.

So if he is to understand the reality around him, it is necessary that he be presented with concrete object which can be touched and manipulated, heard and discriminated, factual perception is highly helpful for him to understand the haptic world. Here we should understand that this may not be a complete substitution for the experience gained through visual perception. He should not be left incidental. When the presentation is a distortion to the child, the teacher should explain it to child. A model of a house, for example, can be easily understood by the child if its dimensions are explained to the child related to doors, windows and other parts of a house which he can touch and feel in reality.

As far as the materials are concerned, the special teacher should take special care in providing the materials which suit to the need of the visually impaired children, provide appropriate materials for the children the selection of the materials is imperative.

The process of concept formation is best on classification means noting similarities and disregarding insignificant differences. Classification depends on sensory experiences. And lack of this sensory experiences can't fail to produce a lack in concept formation. The visually handicapped child receives information through other senses like touch, smell, hearing etc. this is observed that concept received by remaining senses are defective. The information received by sight and touch are different. A sighted child can see anything to make his or her concept formation at a glance. But a visually handicapped child can't do the same for making his/her concept formation. Visually handicapped child makes his or her concept through part to whole. So visually handicapped children have some difficulty in formation of concepts.

## 1.8 Let us Sum Up

- A good method of teaching is based on multi-sensory approach, whether teaching disabled children or non-disabled children.
- Loss of one sense of the child adversely affects the concept of development of children with visual impairment.
- As far as the children with disabilities are concerned, providing concrete learning experience becomes pertinent.
- Teaching methods should be modified to suit the individual learning styles of disabled children.
- Since disabled children have to learn curricular as well as expanded core-curricular activities, mastery of the child over certain skills are more important comparing the child with another child.
- A number of strategies can be successfully employed for teaching the visually impaired hildren. For example giving as far as possible concrete and real experiences, giving opportunity to a child to explore an object bit by bit and then forming a meaningful whole by establishing relationship.
- Early intervention refers to planned and organized efforts to enhance the

development of children, who have a difficulty or are at risk of developing.

- The goals of early intervention programme are accomplished by providing developmental and therapeutic service for the children with disabilities and support and instruction for their families.
- Concept development involves sensation, perception, classification and image formation. Concepts are set to have been developed or formed when an individual can name describe an event or place in its absent. For example the description of a table even though the table is not there is the concept of a table.
- Sighted children learn the experience in a "natural way" as a "whole" but visually impaired children in a mediated way in a pieces of information.
- There is no need for special curriculum for visually impaired children who are in the general classroom but special approaches based on multi-sensory experience are needed.
- The guidelines for teaching method should develop based on the learning behaviours of the visually impaired children. Sighted children can easily learn many things just by seeing what is happening around him. But for the visually impaired children it is very difficult. A mere sight will bring lot of information in a fraction of second. So their way of learning is NATURAL, whereas learning of the visual impaired is MEDIATED learning.

## 1.9 Check your progress

**A. Write 'true' or ‘false’:**

a) Concept helps in forming mental maps.

b) Reinforcements help one to learn.

c) A child with visual impairment learns about an object as a part to whole.

Fill in the blanks:

1. Learning of the visually impaired children is treated as.....learning.
2. Reduction in the range and variety of experience is an.....effect of blindness.
3. Mental pictures of the environments combining verbal description and sensory impressions is called.....

Choose the correct answer:

Visually impaired children learn–

a) in pieces

b) the content as a whole

c) like sighted children.

d) the content with more omissions.

**B. Assignments:**

- What is concept development? Taking a suitable example, describe various steps in concept development.
- Define concept development and learning. Mention the effects of blindness on concept development of visually impaired children.
- Enumerate the need and ear1y identification and intervention in relation to children with visual impairment.

## 1.10 References


- Barnett, M.R.(1982). Concept Development for Visually Handicapped Children. (Eds) Lyndon & McGraw. New York: American Foundation for the Blind
- Barraga, N.C., Visual handicaps and learning. Belmont, CA: Wadsworth Publishing Co., Inc.,1976.
- Chapman, E. K. (1978). Visually Handicapped Children and Young People. Routledge, London.
- Fernandez, G., Koening. C., Mani. M.N.G., & Tensi. S. (1999). See With the Blind. Books for Change, Banglalore.
- Hand book for the teachers of the visually handicapped. NIVH, Dehradun, 1992.
- Lowenfeld, Berthold: Berthold Lowenfeld on Blindness and Blind People: Selected paper, AFB. New York 1981.
- Laydon, W. T., McGraw, L. (1973). Concept Development for Visually Handicapped Children. AFB, New York.

- Mani, M.N.G. (1992). Techniques of Teaching Blind Children. Sterling Publishers Pvt. Ltd. New Delhi.
- Mukhopadhyay, S., Mani, M.N.G., Roy Choudhary, M., & Jangir, N.K. (1988). Source Book for Training Teachers of Visually Impaired. New Delhi: NCERT.
- Niemann, S., & Jacob, N.(2009). Helping Children Who are Blind. The Hesperian Foundation, California.
- http://www.eyeway.org/informs/parenting/early-intervention-for-children-with-visual imapirments
- Resource Teachers' Manual-RKMVU FDMSE
- Teacher Training Handbook In the Area of Visual Impairment- RKMVU FDMSE.
- Warren David H: Blindness and Early Childhood Development, AFB, New York, 1984.

# Unit - 2 ❐ Mathematics

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## 2.1 Introduction

Mathematics cultivates child's thinking and reasoning skills. Child learns to seek and discover ideas himself. Mathematics lays the foundation for systematic thinking through the numerical and spatial aspects of the objects. Learning of mathematics is considered vital because of the complexity involved and its application value in day to day life. One of the major objectives of teaching mathematics is to develop computation skills, to emphasize logical thinking and to enable the child to participate in day to day activities of the family and community. The utility value of learning of mathematics is something phenomenal, considering the amount of application of mathematical concepts in one's life. The importance of learning mathematics has been emphasized not only for the sighted but also for children with visual impairment in many forams across the world.

For sighted and visually impaired children, modes of learning are different. Teaching to sighted children is through writing on the blackboard supplemented by oral instructions. While for a visually impaired child mathematical Braille code, appropriate material and devices are important, along with appropriate teaching techniques and strategies. Mathematics is often questioned by highlighting some of the areas in Mathematics that demand vision.

The visual ideas could be converted to nonvisual experiences so as to enable children with visual impairment to get the required learning experiences. Research reveals that children with visual impairment can also learn mathematics when they are taught in an appropriate manner by making necessary adaptations in the curriculum without altering the learning outcomes. Therefore, special efforts, especially commitment of the teacher teaching mathematics and an effective application, would bring out useful adaptation techniques to enable children with visual impairment to achieve the same learning outcomes. Evidently, learning of mathematics is considered to be a complex process even for the non-impaired children too.

The skill of mental calculation is a valuable trait to possess and it is useful in mathematics as well as other educational areas. Mental calculation provides the foundation for the development of higher level thinking skills. It provides children with a new way to think about the number system and number relationships. Successfully performing efficient and effective mental calculations requires a thorough understanding of

mathematical principles. It is not a mechanical, rote method of solving problems. Instead, students learn the principles behind mathematics. Children will achieve an understanding that addition, subtraction, multiplication and division are simply methods to combine or separate numbers. The successful application of mental operations requires a person to be skilled at solving problems and not simply adept at memorization of mathematical formulae. There is a practical need for mental calculation strategies in everyday life.

Evaluation is an ongoing process and its importance holds good for the education of visually impaired child too. Like any other child a visually impaired 1" child's education at development of mathematical concepts. Some very interesting factors need to be taken care during evaluation of mathematical concepts among visually impaired children.

## 2.2 Objectives

After going through this lesson, students will be able to :

- Explain the various techniques to overcome the math phobia
- Explain the conceptualisation of mathematical concepts
- Describe the various factors that promote better learning of mathematics
- Appreciate the role of mental arithmetic and geometry in every day life
- Describe the need and importance of mental arithmetic
- To prepare tactile diagrams and vision oriented concept in tactile form with necessary modification
- Describe implication of visual impairment in learning mathematics
- Appreciate the needs of evaluation of learning mathematics by visually impaired students
- Understand the implication of visual impairment on evaluation in achieveme t in mathematical concept
- Prepare and use evaluation tools for mathematical concepts

## 2.3 Coping with Mathematics Phobias

### 2.3.1 Factors contributing to learning of mathematics

Learning mathematics is considered to be a complex process even for the non-impaired children too. Worldwide, mathematics has the highest failure rates, and lowest average grade achievements. Almost all students regardless of the school type or grade cannot perform in mathematics as per their intellectual abilities. While mathematics for the sighted children itself is in a mercurial state, the same for children with visual impairment is further compounded due to loss of vision. However, teaching mathematics to children with visual impairment has undergone transition over a period of time, resulting in optimistic views toward learning of mathematics by children with visual impairment. What was considered as impossible for children with visual impairment is proved to be feasible and is gaining an optimistic momentum world over. Truely, it is not the difficulty of the child with visual impairment to understand mathematical concepts, but it is the difficulty of the teacher teaching mathematics to make suitable adaptations in teaching the concepts. Days are gone when stereotypic attitudes existed in the society, that learning of mathematics is difficult for children with visual impairment. At the school level, especially for children with visual impairment, a number of factors contribute to effective learning of mathematics.

A good mathematics curriculum must possess carefully chosen objectives that stress a balance among cognitive, affective and psychomotor domains as parts of the instructional strategies. Following are the key factors considered important for effective learning of mathematics by children with visual impairment, among others (Mani, 1992).

**1. Selection and teaching of suitable mathematical Braille Codes.**

The mathematical Braille Code must be introduced to children as and when they occur in the text. By doing so, children should develop knowledge of the Braille mathematical Code and their practical usage. Right from the first standard, the children should be exposed to the text material wherein Braille Mathematical Codes are incorporated. This will give them an idea regarding the format of presentation.

**2. Adaptation of text material to children with visual impairment.**

Adaptation of the text material for visually impaired child without changing the learning outcomes. Darling (1985) states that the learning activities of visually impaired children

can be created without changing the learning outcomes set forth for sighted children. She also states the mathematical aids are of paramount importance in developing the right type of concept in the child.

**3. Teaching of mathematical devices such as Abacus, Taylor frame etc.**

Teaching of mathematical devices e.g. the Abacus, Taylor frame, geo-board etc. to the visually impaired child for making the necessary calculations and understanding diagrams Abacus takes little time in calculation while linear equations are possible to be shown in Taylor Frame. For teaching mathematical diagrams, geo-board and relief sheets are useful.

**4. Provision of appropriate mathematics text material.**

Provisions of suitable mathematics text-material after necessary editing of the content and format, Mathematics learning is not very difficult but it is a long process and makes the child and teacher feel that it is difficult. This cannot be achieved overnight, it needs continuous effort.

**5. Preparation and use of appropriate teaching aids.**

Preparation and use of appropriate teaching aids for supplementing instruction in teaching Mathematics, Like any other child there is need to devise innovative material to give concrete ideas to visually impaired child too.

**6. Provision of simulating experiences, creation of situational approaches etc.**

**7. Mental ability of the student.**

Hence a good and effective classroom, conducive for teaching of mathematics to children with visual impairment must adopt a multisensory approach using a plethora of teaching learning materials with necessary adaptations in the curriculum and must include children with visual impairment as active participants. Children learn primarily by manipulation till the formal operational stage. If children are not taught mathematics with hands on methods up to the age of 12, their ability to acquire mathematics knowledge is disturbed at the point when hands on explorations were abandoned in favour of abstractions. Hence learning by doing, wherever feasible, is the right approach in teaching mathematics to children with visual impairment.

### 2.3.2 Problems of learning Mathematics for visual impairment children

Due to lack of vision, the visually impaired child -

- finds it difficult to gain concrete ideas of form, size, colour, spatial relationships, and spatial qualities of objects;
- is unable to observe the objects in to; thus gains a partial knowledge of the objects;
- is unable to acquire incidental learning;
- faces problems in setting out long multiplication and long division;
- finds it difficult to construct desired geometrical figures;
- takes more time in learning and comprehending mathematical concepts;
- takes longer to feel along a line than to scan it visually;
- faces problem to make the graphs themselves.

## 2.3.3 What is math phobia?

It may be defined as a feeling of anxiety that stops one from efficiently tackling mathematical problems. Many people think of math as an extremely tough subject that they cannot master. This negative attitude stops them from focusing on the subject/ problem which they are tackling. Just before tests or exams they start to get nervous as they are not prepared. Some even learn and understand math but during the time of the test fear clouds their minds and they are not able to perform well. This increases the speculation in their minds that math is too tough for them. In simple term phobia means fear.

**A Anxiety**

One definition of math anxiety is "the panic, helplessness, paralysis, and mental disorganization that arises among some people when they are required to solve a mathematical problem. Math anxiety is a serious and pervasive problem, especially for the visually impaired students who may experience math anxiety in many forms and degrees, from "freezing up" during a math exam, to attempting to avoid anything having to do with numbers. Symptoms may be physical or psychological and may include (but not be limited to) any of the following:

**Physical:** Nausea, shortness-of-breath, sweating, heart palpitations, increased blood pressure.

**Psychological:** Memory loss, paralysis of thought, loss of self-confidence,

negative self-talk, math avoidance, isolation (thinking you are the only one who feels this way).

What are the causes of math phobia?

Math phobia is due to :

- ✓ Poor math performance
- ✓ Poor preparation
- ✓ Negative math experience
- ✓ Math avoidance due to lack of vision
- ✓ Lack of confidence
- ✓ Passive behaviour of the students
- ✓ Inherited trait
- ✓ Community influence
- ✓ Low self esteem
- ✓ Lack of analogies
- ✓ Learning disorder
- ✓ Insufficient study materials for visually impaired children

**B. How to overcome mathematical phobia?**

The first step is to build confidence

- Recognize the symptoms of math phobia
- Start preparing early
- Start with small mathematical problem
- Combat negative thinking
- Do easiest problems first

- Find a support group
- Reward for hard work
- Learn stress management and relaxation techniques
- Sign-up for the proper level of math course.
- Ask questions when you don't understand.
- Give enough time to study for a test.
- Make a test plan to reduce anxiety.
- Revise study habits.
- Reinforce the child's sense of intelligence and skill.
- Create a supportive environment for learning math.
- Schedule study breaks.
- Encourage the child to tackle math one problem at a time.
- Show your child the positive uses of math.
- Familiarize the teacher with improvised math teaching aids.
- Support the positive aspects of math with games, puzzles, and humour.
- Encourage the child to not compare abilities with their classmates.
- Play with math games to find the fun in mathematics
- Keep a positive attitudes
- Encourage creative approach
- Variation in approach
- Parents, guidance
- Strengthen students basic skill
- Use step by step approach
- Use multisensory approach
- Active role of the teacher

## 2.4 Conceptualization of mathematical ideas

The role of vision is so vital during the early years of life to learn concepts. Devoid of the sense of vision, it is an accepted fact that the children with visual impairment are in a disadvantageous position. However, teaching methodologies including multisensory approaches where in the remaining senses are utilized optimally to compensate the loss of vision comes in handy.

Learning of mathematical concept in parts logical thinking and numerical skills are besides reasoning. Evaluation of learning in mathematical concept aims at-

- Assessing.
- Understanding of the concept.
- Development of skills to do mathematical operations
- Ability to find solutions of mathematical problems
- Understanding the concept of time, distance, money measurement etc.

Mathematics is a deductive concept and proposition'. The basic concepts of any branches of mathematics have to be general and minimum possible. For example the concept of natural number does not refer only pebbles or apples or coins or houses part to any and all entities which satisfy set of axioms. The axioms are propositions whose validity is considered to be self-evident.

The visualy impaired may lack in the incidental experiences which his sighted counter parts can make use of. Therefore, they need successive interactions with basic experiences and suggestion to arrive at the desire in intuitive grasp of the concept. For example, while teaching the concept of line to an eight year old sighted child it may suffice to draw a line on a black-board and say that this represents line. The line which you observe as edges of walls of rooms, rail tracks etc, it can be extended on either sight it has no thickness etc. but for a visually impaired child of same age we will have to put the learning activities in such an order that the desired learning of the concepts are effected. We may present to him concrete objects for manipulation to explore the edges, with his finger he may explore the extension of thread wire etc. subsequently embossed diagrams on cards can be used to fix the idea.

The children should arrive at an intuitive grasp of the mathematical concepts through

experience with concrete and semi- concrete material adapted for their use. The order of complexity of arrangement of material should be conducive to a sequential learning of the concepts. The principle of mathematical variability should be followed in eliciting the grasp of the concept. For example, in teaching the concept of place value one should use counters, using a bigger or tactually different counter for every tenth object to be counted. Thereafter, a Spike Board with counters may be used. This can be followed by use of a ten base abacus and only after this the 'crammer abacus' should be used. The same idea of place value can be given by using apparatus . The flow of activities is from concrete exploratory activities leading to abstracting and intuitively grasping the concept to its application to other situations aided by language to generalising and use of notation and symbols.

The four Arithmetical operations can be taught using concrete and structured material like number board, unifix cubes, marble, match stick etc. The structural properties and inter-relations among the four operations can also be conveyed by the use of these materials.

The algorithms should be of few steps only and the reason behind their formulation should be clarified before they are used for drill work. There are situations when the algorithms which the sighted children use can't be applied by the Visually Impaired children. A case in point is the addition of fractions. As the notations of fractions in braille is such that the step of multiplying the denominators in the addition algorithm can't be done easily by the Visually Impaired children, an appropriate substitution will be using the notion of fraction as a denoted ratio and reformulating the algorithm.

The idea of space, time, and derived concepts like speed etc. appear to be one of the major problem areas for the Visually Impaired children. This should be linked with the mobility training so crucial for their daily living. For example, the concept of graphical location can be given by pegging two ropes with knot at one pace interval placed perpendicular to each other on a ground. The children can locate an object like chair, another child etc., by starting from the origin. The teacher can give directions of movement along the axes. Subsequently, the same exercise can be done on paper and later on embossed graph paper can be made available to the children. The use of the magnetic board can also be made in giving the geometrical concepts particularly, those involving flexibility of movement and locus. A visually impaired person gains knowledge of the spatial qualities of objects only by tactual observations in which kinesthetic

experiences play an important role. Since touch requires direct contact with the object to be observed, visually impaired children often gain a partial knowledge of objects that they cannot observe in toto. Also, the sense of touch generally functions only if it is actively employed for the purpose of cognition. Whereas vision is active as long as the eyes are open. A visually impaired student needs to learn systematically what a sighted child can pick up incidentally from the environment. Thus, a visually impaired child is limited in the range and variety of his experiences and educational measures are necessary to overcome this limitation.

Development of mathematical concepts among children starts with number concept. The curriculum for mathematical concepts is set up very carefully. Efforts are made that it has direct utility in day to day life. In secondary school mathematical concepts form an important part of academic skills. Evaluation is essential to ensure that the objectives are being achieved and identify the areas of improvement.

The following factors have direct bearing on evaluation of mathematical concept among visualy impaied children

- ✓ The visually impaired child should be encouraged to master the skills of using abacus, Taylor frame and geometry kit effectively. At the time of evaluation they should be provided with the necessary equipment.
- ✓ Visually impaired children should be introduced with Braille mathematical code as and when it appears in the textbook
- ✓ Visually impaired children should be provided with Braille books in mathematics well in time. The question papers in Braille should use only those mathematical codes that have been taught to the child.
- ✓ The visually impaired children should be exposed to all the mathematical concepts including geometry and trigonometry.
- ✓ Innovative methods should be used to make mathematics interesting for visually impaired child

## 2.5 Preparation and use of tactile materials:

Mathematics text ryaterials: The use of braille text materials in mathematics can't be overlooked for visually impaired students. The content in mathematics text books which

contain more of facts and procedures should be presented in tangible form to the visully impaired child to, enhance his learning. Mathematical text materials requires a lot of editing since it contains geometrical diagrams, mensuration diagrams, trigonometric figures. Under each lesson so on, presentation of text materials should not confined the visual impaired child when using the materials along sight his fellow sight counter parts. In case of modifications of the diagrams, instruction bove the kind of modifications could be specified. Similarly in case of omissions of the' diagrams or an exercise, it is very vital to explain the concept of text and the reasons for omitted portion.

The adopted mathematics instructional materials should be presented and supplied in to regional language. Supplementary teaching aids should be given along in the rnstructional materials. In order to facilitate the visualy impaired teacher should prepare the materials in braille. In adapted instructional materials one has to bear in mind following aspects.

- Duplication as per possible
- Modification of the lesson without changing the concept
- Substitution of a model for giving the same approximate experience
- Omission under unavoidable circumstances

Truly speaking" The hand is the eye of the visually impaired". Tactile materials or diagram should be prepared in such a way that visually impaired children are able to explore, identify, discriminate and recognize it without much confusion. Tactile materials should make the teaching effective, quicken the pace of learning, help to overcome the burden in learning, provide first hand concrete experience and bring variety to the learning of visualy impaired students. The sense of touch becomes more important media in learning process and also it pro~s enrich experience such as shape, size, texture, hardness, softness, weight, dry or moistness, hot and cold etc. hence the preparation and presentation of tactile materials should follow the following aspects:

Tactile materials or diagrams should stimulate and motivate the visually impaired students.

- The size of the tactile diagram for the visually impaired students should be within two hands of the users,
- If should convey only central idea of the lesson supported by its components.

- It should provide an appropriate tactile experience.
- It should be simple and clear in shape and size.
- It should make the teaching effective and the learning interesting.
- It should , quickness of pace of learning and overcome the hurdles in learning.
- It should be strong and sturdy enough to have longer durability.
- Title of a diagram should be placed at the top of the diagrams.
- Principle ofleveling of the diagram should be maintained from left to right and top to bottom.
- Principles of tactile diagram may be ‘‘make it cheap, use it well and change it often’’
- It should be provide three dimensional and concrete experiences and bring variety to learning of the visually impaired students.
- It should follow principles of tactile tolerance.
- Must avoid tactile jumbling.
- Ratio of enlarged size should be maximized upon the visual competence.
- It should noted overload be with information.

### 2.5.1 Improvisation of mathematical teaching aids for visually impaired Students:

The material for visually impaired children is prepared bearing in mind the suitable principles-the maximizing of the duplicated material, the modification of format and content for necessary adaptation, the substitution of ideas/ lessons for optimum learning experience of the child and rare omissions under unavoidable circumstances. Mathematics being an abstract subject, which involves the appearance of concrete, pictorial and abstract concepts, all the four principles should be used in preparing text material.

To supplement the use of mathematical text material, a small guidebook in Braille consisting of the model problems, certain diagrammatic illustrations, etc. can be provided to the child. Davidson's (1988) study also highlights this need. This helps the child, especially during the examination time, to revise. Even though it experienced that

Mathematics lessons could not be recorded into cassettes as whole, certain steps such as formulae, methods of constructing a diagram in the case of geometry, etc. can be recorded in a cassette. All possible alternatives have to be explored for making the teaching- learning in Mathematics more purposeful.

Mani (1993) highlights the importance of three- dimensional aids and the need and nature of improvisation of aids in the teaching of Mathematics to visually impaired children. Since vision plays a predominant role in the assimilation of ideas by observation, certain aids, which are commonly available for sighted children have to be adapted to suit the needs of the visually impaired children. The concept of tactile attraction is to be emphasized in preparing teaching aids, so that the child does not encounter any difficulty in understanding the concept. In Mathematics, most of the teaching aids can be presented tactually because they are aiming at the development of certain concepts. Area, volume, height, weight, elevation, scale value, etc., are some concepts which can be effectively explained through three dimensional teaching aids.

Geometrical devices can also be adapted to the needs of visually impaired children. For example, in the normal Protractor made out of plastic, big wholes can be made for every ten degrees and small whole's for every five degrees without breaking it.

Visually impaired children can have difficulties with Mathematics, as Clamp (1981) points out, this is likely to be due to underdeveloped mathematical concepts and not due to an inability to achieve. They can be good achievers in Mathematics if an emphasis on concrete experiences is given.

According to Brown (1983), in his concept on systematic approach to instructional technology, the central focus is on the students, their needs, capabilities and achievements as they work towards desirable levels of competence and performance. There are four fundamental questions. First, what goals are to be achieved? Second, how and under what conditions students aim to achieve these goals. Third, what resources are required for necessary learning experience And fourth, how far the goals were achieved. This process also provides guidance for necessary improvements in instructions regarding what needs to his changed.

## 2.6 Mental Arithmetic Abilities

### 2.6.1 What is mental arithmetic?

*Mental Arithmetic Skills -*

Hall (1954) defines mental arithmetic as ...

1) Arithmetic problems which arise

a) in an oral manner

b) in written form, or

c) "in the head" of the person who needs to solve the problem;

2) Problems in which pencil and paper and other mechanical devices, such as calculators, are not used to record the intermediate steps between the statement of the problem and its answer;

3) Problems in which pencil and paper are used, and problems in which they are not used, to record the answer;

4) Problems in which quick estimations are made which either mayor may not be verified by a written response.

Mental arithmetic is an ability to calculate and get a correct answer without using paper and pencil or any other electronic devices. Mental arithmetic is an form of training which enhances a child's ability to calculate without the aid of any instrument, such as paper, pen, pencil, calculator or abacus. The child will be able to calculate with speed and accuracy using his/her own mental power and can surpass the speed of even a calculator. It starts with the use of an abacus and soon the child learns to calculate mentally without a physical abacus. Mental arithmetic is fun filled learning. When the mind gets constant exercise, mental power of the child gets a boost. Just like equipment at the gym is a medium of body building. So also for brain development, mental arithmetic is proven medium.

**In short, Mental Arithmetic + Practice = Brain Development.**

Mental arithmetic training will have several positive benefits. These are:

- Greater concentration
- Keen Listening skills

- Better reflexes
- Better application skills
- Improved analytical skills
- Better creative and imaginative skills
- Better Memory
- Sharper observation
- Self-confidence
- Better comprehension and calculation skills

### 2.6.2 Importance and applications of mental arithmetic

The important point that emerges about the nature of mathematical concepts is that the elementary and most general characteristics are most significant and so also the process of their generalization which may be abstract. The perception of these concepts can be achieved only intuitively. The visually impaired are no less competent in this intuition, and mental computation is not likely to cause any particular difficulties. Visually impaired children become adept at this since they are used to relying on their memories rather than referring to books for prompting. In order to develop the mental ability of doing mathematical calculation, concentration and a mastery of basic mathematical operations are required. As in the case of other activities, this too needs systematic instruction, practice and application. In visually impaired children, this exercise could start with the learning of the abacus. Calculations in the abacus require a mastery over the multiplication tables and ability in the abacus contributes to mental abilities in calculation. Once the child is proficient in operations with the abacus, ranging from addition, subtraction, multiplication, and division (especially long division involving many digits) up to the process of calculating square root, percentage etc., he/she can be trained to use short-cut techniques in computing the values. For example, 642 x 123 can be divided into various steps such as 600 x 123, 40 x 123, 2 x 123 and even further depending upon the ability of the child to store the calculated values in his/her brain before making the sum total of the entire calculation. Training in remembering a set of numbers over a period of time, games for calculations, etc. can be performed by the student and teacher in order to gain sufficient practice. Prolonged training and practice in performing mental calculation & help the child to acquire a mathematical mind,

which is very essential for problem solving, analysis of information, a scientific approach in performing day-to-day activities, etc.

After each exercise in improving mental calculations, it is necessary for the child to verify his/her answer with the help of mathematical devices such as the abacus or Taylor Frame. The process of calculation in mathematical device helps himlher to discover where the mistakes were made during the mental calculations. Kalaiselvi (1985) studied the effect of the abacus and the Taylor Frame in teaching mathematics to visually impaired children.

Thompson (1999), in an effort to support/advise teachers to meet the changing curricular demands of increased emphasis on the development of a child's mathematical mental calculation abilities, provided a comprehensive list of the most commonly used mental calculation strategies used for one digit number operations for primary school aged children. Thompson (2000) also produced a list of the most commonly used strategies for two digit number operations. Thompson (1997) used these strategies in his research study in which he attempted to determine if written methods could actually reflect mental calculation strategies. The focus of Thompson's work involved addition and subtraction operations only.

The research of Hope and Sherrill (1987) revealed a number of calculation strategies. As previously noted, the study participants included 15 students skilled in mental computation and 15who were considered unskilled. Analysis of the student reports indicated that 3 methods and 4 strategies per method were used to solve the calculation tasks.

I) Mental pencil and paper - doing the same mental processes in one's head as he or she would conventionally do on paper.

a) No partial product retrieved - i.e. 25 x25 -7 "five times 5 is 25, carry 2, 5 x2 = 10 plus 2= 12 etc."

b) One partial product retrieved - i.e. - "5 x 48 is 5 x 8 = 40, carry 4, 24,

240. And 2 x 48 is 96, etc. NOTE: 240 was calculated digit by digit but 96 was retrieved as numerical equivalent.

c) Two partial products retrieved as numerical equivalents. 12x250.2 x 250 = 500, 1 x 250 is 250, move over one, 3000!

12x250=(2x250)x6 = 500x6=3000

d) Stacking - each partial product was completed digit-by-digit and visualized as a stacked arrangement. i.e. 8 x 999 is 72,72 and 72 right across.

72f-(j 2f-(j 2 = 7(2+7)(2+7)2 = 7992

2) Distribution- transforming one or more factors into a series of sums or differences.

a) Additive distribution - each partial product is added successively to produce a running sum. i.e. 8 x 4211 = 8 x 4000 = 32000,8x200 = 1600 and 8 x 11 is 88. Answer: 33688.

b) Fractional distribution: applied when factor contained a "5" as a unit digit.

i.e. 15 x 48 was calculated as 1 Ox 48 = 480 and half of that is 240 so the answer is 720.

c) Subtractive distribution - used when students thought expressing the numbers as a difference made the calculation more tractable. i.e. 8 x 999 is the same as 8 x (1000 - 1) = 8000 - 8 = 7992.

d) Quadratic distribution- The algebraic identity for the difference of squares (x - y) (x + y) = X2 -/. So, students solved by the problem 49 x 51 by changing it to 502-1.

3) Factoring - one or more factors in the task were transformed into a series of products or quotients rather than a series of sums/differences.

a) General- factoring one or more of the factors before applying the multiplication law. i.e. 25 x 48 = (5 x 5) x 48. 5 times 48 = (5 x 40) + (5 x 8) and 5 x 240 is 1200.

25x48 = 5x5x48 = 5x{(5x40)+(5x8)} = 5x{200+40} = 5x240 = 1200

b) Half and double - This strategy is used when one factor is a multiple of

2. i.e. 12 x 15 equals 6 times (1/2) 30 (double) = 180.

c) Aliquot parts - transforming one factor into a quotient.

d) Exponential factoring - used to calculate products of power through the exponential rule. i.e. 32 x 32. 32 is 2 to the 5thpower, squaring this is two to the tenth power, "which I just know is 1024." For this person 210 is a numerical equivalent of 1 024.

Some of these strategies have been described in the work of Hazekamp (1986) and Atweh (1982). However, these authors identified several strategies unique to their respective reports. Hazekamp discussed the rules of multiplying by 5, 50 and 100:

By 5 - Divide by 2, multiply by 10. 5 is 10 -7- 2

By 50 - Divide by 2, multiply by 100. 50 is 100 -7-2

By 500 - Divide by 2, multiply by 1000. 500 is 1000 -7- 2

For example, the problem 364 x 50 is solved by dividing 364 by 2, yielding 182. Next, multiply by 100 to give 18,200.

Atweh provided an interesting strategy for a multiplication calculation that can be performed assuming two criteria are met. First, the units digits must add to ten. Second, the tens digits must be the same. If both of these criteria hold true for a problem, the problem can be solved by multiplying the units digits to yield the last two digits of the product. Then, increase one of the tens digits by one, keep the other the same and multiply. The result is the first two digits of the product. i.e. 64 x 66 ... 6 x 4 = 24, the last two digits in the product.. .. and 7 x 6 = 42 ... is the first two digits in the product.

Therefore, the answer is 4224.

These studies reveal that most teachers working in residential schools are unaware of the use of the abacus. The study recommends that systematic instructions should be given to handle the abacus, and mental calculations can be developed in primary & elementary level children by the play way method. F or this reason, it becomes important to teach mental math to children in primary level. This in turn improves their ability to use four arithmetic rules in high speed to obtain solutions without the use of any tools.

One of the most important factors to consider in this process is the manipulation of numbers in the head. Creating number sense is one of the most important steps towards realizing this goal. This is for the simple reason it incorporates estimation, measurement and place value. This concept in turn makes it easy for students to memorize math facts easily. The best manner in which to teach mental maths is to string random numbers together and ask students to find the solution. In order to effect this with ease, it is therefore important to teach children how to conceptualize the mathematical process. As they learn how to carry out these calculations in the mind, speed to find solutions is also established.

As students become more accustomed to working with numbers, then it becomes easier to provideftimes tests. However, if they have not learnt the concepts, it is advisable to stay awal from this strategy as it only serves to aggravate the students without delivering any results. At this point, it is important to state that teachers should not use any manipulative techniques to teach students. Rather, they ought to focus on teaching them how to think and reason in a mathematical manner. The most important way of ensuring that mental maths concept is accepted and ingrained in students is by incorporating it into the daily programme.

## 2.7 Evaluation procedures with special reference to the needs of children with visual impairment.

The goal of education is all round development of the child. Evaluation is a mirror, which, reflects the extent to which teaching objectives are achieved. Evaluation is essential to ensure that the objectives are being achieved and identify the areas of improvement. Through evaluation suitable modifications are incorporated from time to time to develop desirable skill among children. The remedial steps are possible only through effective evaluation procedures. Evaluation, therefore, has to be continuous and comprehensive. It implies that evaluation should encompass all aspects of teaching objectives. Evaluation is required to assess the pace of pupil's progress, identify learning problems, taking teaching related decisions. In this way evaluation can be a day to day, lesson to lesson, and unit to unit process.

Evaluation data are collected through different sources, informal evaluation and formal evaluation Informal evaluation is usually in progress when the teacher asks questions during the lessons or observes child behavio in some situations incidentally. For formal evaluation several systematic procedures are followed. The most important is achievement test. Several types of questions are used as tools in achievement tests. For example, very short answer type, short answer type, essay type, multiple choice type, matching type, true/false type, fill in the blank type, problem solving types, draw the diagrams types etc. Preparation of tools for evaluation of mathematical concepts among visually impaired children must be in accordance with the following guidelines

a. The tool should ensure equal opportunities to visually impaired children; therefore, they must be compensated with extra time to attempt their questions.

b. The visually impaired children should be subjected to evaluation at regular intervals

rather than once or twice a year. The assessment report should reflect their regular performance in the class

c. There should be complete evaluation report consisting of information about their non-academic activities so that the same could be used for guidance and counselling

Visual impairment among children needs to be understood very well during evaluation so that the basic objective is achieved. During evaluation following implications of visual impairment must be considered:

a. Visually impaired child expresses through writing in Braille script or through use of typewriter or amanuensis. Suitable arrangements should be made during evaluation process

b. The said methods of expression consume more time Therefore, visually impaired children should be allotted with extra time at the rate of 20 minutes per hour to ensure equal opportunity and compensate for time consuming procedures through which visually impaired child has to go through.

c. For Mathematics, Visually impaired child needs abacus or Taylor frame, Geo- board, The necessary arrangement should be made.

d. The missing visual experiences in terms of diagrams and other exposure should be compensated through tactile experiences to a visually impaired child. Alternative questions should be provided in the question paper for graphs, geometrical construction and similar other visual based questions.

e. Opportunities to build verbal description memories for visually impaired child. Suitable flexibility should be provided to give description of diagrams instead of drawing, to visually impaired child.

f. Making educational material available in large print for low vision children. Evaluation system should ensure providing question papers in large print for low vision children.

The adjustment and adaptation of evaluation and examination procedures should be

viewed from the point of view of presenting the test questions and the modes of answering by visually impaired children. The guiding principle is that the procedures should be as close as possible to the practice with sighted children. The purpose of adaptation is that visually impaired children should not be at disadvantage in evaluation and examination

due to their impairment. Substitution and omission should be the last resort. few ways in which questions can be communicated to visually impaired children and th ir answers can be elicited are given below:

**Modes of questions**

- Written in Braille basically elementary level.
- Written in print but read by a reader for the visually impaired child.
- Listening by the visually impaired children from audio cassette player.
- Oral questioning is more stressful in primary level by the examiner.
- Combination of the above.

**Modes of answers**

- Writes himself in Braille.
- The scribe writes for him basically secondary and above.
- Records on audio cassette.
- Give answer orally to the examiner.
- Combination of the above.

**Generally,** Mathematical calculations are taught step by step so that a student has a sure way of arriving at a proper conclusion. The visually impaired child should know and understand these steps. However, for speed and simplicity, visually impaired students are taught mathematical calculations with an abacus, and present their answers in Braille on a separate answer sheet. This does not mean less work or less study for the visually impaired child it actually means more. Yet, in practical life situations, the abacus and Taylor frame is most functional as a substitute for pencil and paper for the visually impaired students. Abacus work must be done very carefully. For example 6542 + 2364 = 8906. At times the student may write the answer 7906.

In this case while the answer is indeed wrong, the error is most likely in the mere movement of one bead. The teacher should congratulate the student for the portion completed successfully, and bear in mind that the students need more time to learn to handle the abacus effectively. Teacher's flexibility in this aspect is highly appreciated.

The problems of teaching to visually impaired students of mathematics can't be treated in isolation from the problems of mathematics education prevailing in general. The paper has attempted to look at the situation in a holistic manner and identified problems-most of which are general in nature, and others specific for the visually impaired learners. Basically, the suggestions that have emerged are:

- Build a faith in the mathematical capabilities of children in general, and visually impaired children in particular;
- Provide concrete experiences to build mathematical concepts;
- Modify concrete materials for visually impaired children; it may be an enriching experience for others;
- Provide active and encouraging teacher-guidance for accommodation and assimilation of new mathematical meanings into the existing structures;
- Provide specific instruction and practice in neat precise, formatted presentations, and
- Provide better alternative materials for use by visually impaired children.

Given an improved system of mathematics education in general and non-visual materials and experiences in particular, a child may not find learning mathematics a distant possibility simply because one has already suffered loss of vision.

## 2.8 Let us Sum Up

- Visually impaired students can also learn Mathematics if taught in an appropriate manner despite being questioned by highlighting some of the areas in Mathematics that demand vision.
- Various factors contribute to better learning of Mathematics, such as selection and teaching of suitable mathematical Braille Codes, adaptation of the text material; teaching of mathematical devices and preparation & use of appropriate teaching aids.
- Visually impaired students face certain problems in learning Mathematics due to lack of vision such as difficulty in gaining concrete ideas of objects, setting out long multiplication and long division Visually impaired students take longer to feel along a line and face problem to make the graphs themselves.

- Mental arithmetic is an ability to calculate and get a correct answer without using paper and pencil or any other electronic devices.
- For low vision children question paper in large print should be provided. Low vision children may write answers by themselves or with the help of scribe.
- There are important implications of visual impairment on evaluation in the achievement in mathematical concept.
- Evaluation is a continuous and comprehensive process and important component of teaching learning process.
- Learning mathematical concepts involves logical thinking and numerical skills besides reasoning.
- Evaluation of learning mathematical concepts aims at assessing, the concepts understanding, skills to do mathematical operations, ability to find solutions to mathematical problems, and understanding the concepts of time, distance, money, measurement, etc.

## 2.9 Check your progress

**A. Write the appropriate answer**

1. Instructional objectives are based on

   a) Content to the cover

   b) Expected change in the behavior of the student

   c) Teaching methods

   d) Instructional environment.

2. Braille mathematical code for India was adopted in

   a) 1952

   b) 1979

   c) 1989

   d) 1996

3. Remedial teaching is based on

   a) Mental mathematics

b) Teaching method

c) Evaluation

d) Diagnosis

4. Reading a mathematics braille book may be dificult for a visual by impaired student Because

a) Lack of interest in mathematics

b) Unawareness of Mathematical braille codes

c) Bulkiness of the book

d) None of the above

5. Learning of mathematical concepts means

a) Development of logical thinking

b) Numerical skills and reasoning

c) Ability to find solutions of mathematical problems

d) all of the above.

6. Algebra can be taught through

a) Taylor frame

b) Abacus

c) Braille

d) All the above

7. Geo-board is used to teach

a) Geography

b) Clock Concept

c) Geometric figures

d) All the above

8. Evaluation includes

a) Qualitative descriptions of student performance

b) Students value judgment concerning the desirability of that performance

c) None of the above

d) Both (a) & (b)

9. In evaluating the braille answer sheets the child should be downgraded for

a) More conceptual error

b) More braille error

c) Neatness

d) None of these

10. The devices for mathematical calculations are

b) Slate and stylus

c) Abacus and Taylor frame

d) Braille writer

e) None of these

**B Activity**

i. Describe the major factors that affect the learning of mathematics among visually impaired students.

ii. Enlist the factors that can cause difficulty in learning mathematics by visually impaired students

iii. Explain the characteristics of tactile diagram while preparing for the visually impaired students.

iv. How can braille mathematical symbols help in learning mathematics by visually impaired students ?

v. How can learning of mental arithmetic by visually impaired students help them in day to day life situations.?

vi. Write briefly about the implications of visual impairment on evaluation in the achievement of mathematical concept.

vii. Draw various types of angles, triangles, quadrilateral on relief sheets by using Geo-board

## 2.10 References


Advani, Lal, (1992). Effects of Visual Disabilities on Cognitive Development. Handbook for the Teachers of Visually Impaired, pp. 27-43, N.I.V.H., Dehradun, India.

Agrawal, S. " Teaching Mathematics to Visually impaired Students through Programmed Learning Strategies".

Chander, Ramesh, (1992). Teaching of Mathematics to Visually Impaired Children at the Primary Stage. Handbook for the teacher of the Visually Impaired, N. J.V.H. Dehradun, India.

Clam S.A(1981). ' Primary Mathematics for Visually Impaired Children', 'Insight, 3(2).

Danielson, E. (1983). Mathematics in Braille: a reference book for teachers and students. Burwood, Melbourne: Royal Institute for the Visuallyjrnpaired

Fernandez, G., Koenig, C., Mani, M.N.G. & Tesni, S.,( 1999). See with the Visually Impaired. CBM, Bangalore & Books for Change, Bangalore.

Gupta, J.D. Mathematics is a Language: A rational for math-instruction", Int. J. Math. Edn. In Sc. & Tech. 1980, 11, 1, pp. 29-32.

Gupta, I D , (1992). Mathematics and the Visually Impaired Teaching at the Secondary School pp.246-269. N I V H , Dehradun, India.

Heritage, R.S (1986). A guide to the teaching of Math's at the primary level to pupils with visual handicaps. Research Centre for the Education of the Visually Impaired, University of Birmingham

H. Van Engen, " The formation of concepts". In The Learning of Mathematics: 21st Yearbook of the NCTM. Washington: National Council of Teachers of Mathematics, 1953.

Lowenfeld, B , (1974) Visually Impaired Child in School. London Constable

Mani, M.N.G., (1985) Education of the Visually Impaired in Normal School Coimbatore Discussion Document: UNESCO Regional Planning Seminar and Workshop on Special Education

N I V H. (1992). Handbook for the Teachers of Visually Impaired Teacher Training Unit, Deptt of Special Education, NIVH, Dehradun

Nemeth, A. (1959). Teaching meaningful mathematics to visually impaired and partially sighted children, New Outlook for the Visually impaired, 53, pp. 381- 421.

Scholl, G.T., (1986) Foundations of Education for Visually impaired and Visually Impaired Children and Youth Theory and Practice New York, NY American Foundation for the Visually impaired Inc.

# Unit - 3 ❐ Science

**Sturucture :**

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## 3.1 Introduction:

Teaching and learning of science implies a number of things. For some a science course impiles definitions, formulae and classification. Some view it as development of scientific thinking methodological careful observation, accurate recording of data to assist in formation of judgements and conclusions. A science course covers a wide range of experiences- observation of scientific phenomenon in day-to-day life to laboratory experiments of simple to very complex phenomenons. Method and media employed also very from textbooks, to real life observation to stimulated experiments. Topics covered range from personal hygiene, weather conditions, astronomy to laboratory sciences like physics, chemistry and biology. But general opinion is that science is a tough subject, depends a lot on sense of vision, hence not convenient

for visually impaired children. But this is not the truth. As suggested in the first capsule of this module, adaptation of methods and materials can make it a subject of interest and mastery for younger visually impaired children to grownups. Science books can be brailled in the same manner as are brailled other textbooks and main reference books. Verbal explanation is always employed to clarify the concepts and phenomenon. They can be recorded or brailled and need very little editing except for diagrams and notations. The diagrams need to be translated into tactually perceivable form or description can be substituted.

## 3.2 Objectives :

After completing the activities specified in this capsule, the reader is expected to realise the following objectives with reference to visually impaired children.

i) Describe the importance of teaching science.

ii) Identify the ways of teaching science.

iii) State the role of experiment in learning scientific concepts.

iv) Explain the usefull ness of laboratory

v) Understand the differnt methods ofteaching

vi) Understand the importance of uses ofTLM and Equpments in teaching science.

vii) Demonstrate the methods of evaluation and examination procedures with reference to visually impaired children.

## 3.3 Providing first-hand experience in the class and the school environment

### 3.3.1: Ways of learning Science

One of the foremost methods by which children learn science is through first-hand experiences. Even in the primary standards, whenever a teacher is trying to demonstrate or explain a concept, it is useful for her to have materials trying demonstrate or explain a concept, it is useful for her to have materials which show or display that action or system or method. The visually impaired child sometimes needs special opportunities for tactfully exploring or having careful, prior explanations of, or follow up information about. But first- hand experiences should be correlated with helping

children to recall what they have experienced, and making deductions from them.

The second way is that very young children enjoy first- hand experience by undertaking field trips. A field trip to an industry, visits tao the neighbourhood and community are useful in stimulating awerness of the environment. Visually impaired children can make collections of rock specimens, leaf collections etc. There are many things that primary level children can do in which thay can be active during group excursions and field trips. During field trips, the children need to know what they are looking for; they need to be oriented to what to expect, during the field trip. On their return, they should be asked to correlate their experiences with the lessons. This will help visually impaired children to develop concepts through first hand experiences.

The third way of instructing visually impaired children is through group study. Often, children acquire more knowledge through study among a peer group then when by themselves. In project learning, the visually impaired child can be linked with a group of sighted students. In these activities visually impaired children understand experiences.

### 3.3.2 Principles of Science Teaching

An important prerequisite in science learning is motivation. Without interest and incentive learning does not become meaning ful. Motivation may therefore be said to be the heart of the learning process. The teacher should introduce the topic of science in an interesting way and make the content presented meaningful so that the learners find their work interesting and do all activities willingly. It is the responsibility of the science teacher to evolve new patterns in his teaching to motivate the pupils to learn with zeal and eagerness. He should make use of incentives such as : providing scope to display pupils' work; providing opportunity to do independent work; giving responsibility and leadership in scientific activities; keeping the pupils informed of their progress in science; providing opportunity for pupils' demonstration; arranging for pupils' cooperative enterprise in science; organising field trips or visits and also science clubs and science fairs; creating a sense of healthy competition among the pupils. The learners should be actively involved in the learning experience. But in science, many concepts such as atoms, molecules, energy, etc. Are beyond the direct experience of pupils. Models and other audiovisual aids should be useed to explain these concepts or principles.

The teachers should be familiar with psychological principles of learning the law of readiness, the law of exercise. The effect of motivation and incentive have been discussed earlier, these are connected with these laws. Another important consideration

which the science teacher should know is that different pupils learn through different ways. Some pupils learn through actual handling and manipulation; others learn better through audio-visual aids and still others learn well through demonstrations. The science teacher is fortunate in this respect, because he can use a variety of resources or arrange a variety of activities for science teaching. Plenty of charts, diagrams, graphs, maps, or films are available for science teaching. It is also possible to find suitable places for field trips or visits. The availability of reference books, journals, pamphlets or illustrated booklets in regional languages varies from state to state. But such material is easily available in the english language. Demonstration may be given with the help of simple or improvised apparatus. The science teacher should resort to these ave nues for teaching science, according to the circumstances.

### 3.3.3 Science learning at the Primary Stage

The pupils at this stage are inquisitive and curious to know the things around them. They ask questions about the hows and why's of things and events that occur in thair environment. They are fond of playing and always keen to do something. This is a period of rapid growth; they possess energy and are always restless. They like to spend more time with friends and take and take special interest in nature. They take pleasure in construct-ing things with simple tools and ordinary materials. They fascinate stories, fairy-tales or interesting life- stories; they are very imaginative. Brightness, sound, colour, animals or other natural phenomena immediately attract their attention.

The science teacher should take advantage of these natural abilities of the pupils and provide them suitable experiences through doing something. This is the best stage to whet their interest in science. Care must be taken while providing experiences to teach them simple concepts of science. Because once a concept is wrongly conceived, it is very difficult to correct it at a later stage. It, however, cannot be expected that pupils of this stage will be able to understand the abstract ideas of science, or the various applications of science. But they can be trained to observe and develop physical skills.

Pupils should be taken out for first- hand experience with nature. They may be taken to woods, river-side or lake-side, botanical garden, zoo, or public parks. they may be taken to a poultry- farm, fish-farm or an agricultural farm for first - hand experience there. In case of urban areas, the pupils should get the opportunity to experience the varied life of a modern community such as visisting a post office, a railway station, a sea-port or an air-port and see the working there. Each school should possess an aqarium, a vivarium and a garden. Gardening can be very useful in giving the pupils

knowledge of various facts and phenomena of nature. By working in the school garden, the pupils become familiar with the names of various vegetable and flowering plants, the process of manuring and of plant growth. Through gardening, they may be taught simple arithmetic and made familiar with simple plane geomatrical figures; the different plots growing different types of plants may be made triangular, square, rectangular or polygonal in shape. Moreover, working in the school garden satisfies their desire for doing something and develops a sense of dignity of labour and a sense of co-operation. Manual labour is good for their health. The school should also have a science museum where the pupils can preserve their collections.

The teacher should encourage them to collect interesting specimens to be preserved or displayed in the classroom. This satisfies their instinct of acquisitiveness. If the school possesses a small zoo, the pupils feel the school as the most interesting place. The science teacher can utilise the zoo for imparting to the pupils the knowledge of animal habits their behaviour and their relation to man. Interesting activities suitable for the primary level pupils are constructing bird-houses, keeping weather records, scrsp-books or diaries, collecting various types of stones, seeds. Fruits, leaves, insects, butterflies, wild flowers, photographs or sketches of scientists, exploring fields and woods, rearing toads, frogs, insects, birds, rabits, pigeones in the school, making models of care aeroplanes with cheap materials,experimenting with magnets, torch-cells, electric bells. The teacher should also collect interesting illustrated elementary books of science experiments, or biographies of scientists written in their mother-tongue, for the pupils and suggest them to read. He should also try to develop healthy personal and social habits. It is the time for moduling the pupils and to inculate the good habits and attitudes. They should be provided with situations to apply and practise these good habits.

### 3.3.4 Science Learning at the middle school stage

Growth is a continuous process with out sharply defined stages. One stage merges with the other through slow and continuous change. Therefore, the teaching at this stage should be linked with the primary stage, but, because of change in interest and expansion of experiences at this stage, the teacching of science should, however, take some definite form. It is essential that at this stage, marked for increase in physical strength and extreme gregariousness, appropriate activities be provided. Group activity is most suitable at this stage to satisfy their muscular ability and group loyality. They also begain to take interest in the people of the community and other affairs of the society the science teacher should plan activities through which

the pupils may feel the importance of science for the society.

At this stage the pupils seem to be impatient to do things that interest them, but are careless in some of thir habits and actions.the science teacher should therefore plan activities of interest to the pupiles and also arrange suitable activities which demand exactness, care and precaution.

The pupils may be asked to classify their collections and keep them in the appropriate place. They also show keen interest in reading. The science teacher should select appropriate books on elementary science for them to read. This stage is most suitable for training them in necessary mental and physical skills.

### 3.3.5: Science Learning at the secondary stage

The Science teacher should try to exploit the adolescent characteristics for the purpose of teaching science. He should throw challenging problems from the field of science and ask them to solve them. This stage is most appropriate for training them in scientific method careful observation and unbiased judgement. Training in method is an important objective of teaching science in schools. The pupils should be given work in the special fields of their interst. The teacher should also arrange activities to acquaint pupils with the methods and procedures which the scientists follow to explore and exploit nature for our use.

The pupiles should be so engaged in scientific activities, that they may realise the impact of science on the modern society. They should be encouraged to investigate scientific problems individually or in groups. They should be placed in situations where they can generalise and deduce. Their thirst for under- taking responsibility can be met by engaging them in work of projects, science club, science fair, etc. They should be encouraged to take active part in arranging science exhibitions, discussions, or debats on science exhibitions, discussions, or debates on scientific topics, field trips or visits to places of scientific interest. Such experiences in the field of science enable them to learn science through activities appropriate to their age and ability. Due to maturity in skills, many pupils of this stage are keen to repair science apparatus and equipment or to improve apparatus. They should be given an opportunity to do so. The teacher's attitude towards them is an important factor which determines his ability to control these senior pupils. The teacher should work with them in the laboratory or in outdoor activities or engage some of the pupils to perform simple demonstrations before the class. Special talents in science should be given and guidence to flourish in the field of their interest.

Here the science teacher is in an advantageous position for the fact that the adolescents develop the characteristics of volunteering for individual responsibility. But at the same time thay like to work with their friends. They begin to develop a liking for publicity of their success. The teacher should remember that the adolescents like freedom in their actions and resent interference. They like manipulative work and want to do something new by themselves. They eagerly accept project-work and their participation can be profitably used for repair work and improvisation of apparatus and other simple scientific appliances.

## 3.4 Inclusive/collaborative learning for laboratory work

Science teaching is different from the teaching of other subjects for the fact that here the theoretical lessons are accompanied or followed by practical work with apparatus and a mterials The word 'laboratory' generally means a spacious room in which a group of students carry out practicals. Other rooms are usually essential if the science teaching of a school is to be efficiently organised.

On laboratory side there is a large wall black - board provided. Six laboratory tables are arranged as shown. There is a sufficient space between the black- board and the opposite practical table. The tables measures 6'x3' -6'. Four students work at each table. The practical table opposite the black- board is a bit smaller in size and its top is covered with lead. It can be used for placing the common articles to be used by all the students during a prticular expariment. As in the case of the dule tables, the laboratory tables should be free from any dust lodging ornamentations. The only addition to the ordinary type of table is a shelf along the working side just below the top for placing books and papers. No drawers or cupboard of the type used in college laboratory should be provided with the tables.

### 3.4.1 Advantages

The combined lecture room- cum- laboratory has the following advantages :-

1. It is more economical
2. It is compact and inspite of restricted space provides sufficient seating and storage accomodation.
3. It is furnished cheaply and easily
4. The seating accommodation provided is perfectly comfortable and of the type students find in their homes.

5. There is an atmosphere of science, and working in the same laboratory gives an idea of the unity of science.
6. It affords an opportunity for better contol.

### 3.4.2 Role of Laboratory in learning Science Concepts

Laboratories are for the child's learning by doing. As a matter of fact, learning will never be complete if the child is just stuffed with the mere theoretical aspects of topics. Visually impaired children have the ability to perceive water boiling, evaporation of water and the like. The child has to start with this. In a laboratory, once the child attains the ability to pour water into a test tube, he can be given the confidence the use diluted acids in experiments. By the time the experiments with such diluted acids are performed by the visually impaired child for himself, the student will be ready to start the examination of diluted acids, In all circumstances the earnest attempt should be made to explore the possibilities for the visually impaired children in laboratories, rather than to avoid such experiences.

At the high school level, it is usal to group children for experiments in the laboratory. While one child performs the experiment, another child is engaged in recording the reasults; yet another is engaged in observing the experiment. Therefore, this is group learning. The children put all the facts together and present the experiment report. A visually impaired child can be made a member of such team and share the responsibility suitable to him.

## 3.5 Science Teaching Learning Materials and Equipment:

### 3.5.1 Introduction

Psychologists have found that I learning by doing' the most effective method for learning science - has many advantages over other methods, such as reading about principles and concepts of science and their application, and observing others doing experiments. Experiments by pupils inside or outside the laboratory are first hand experiences. It is obvious that to live in this modern scientific world efficiently, first hand contact with the apparatus and materials of science is essential. Demonstrations also provide some direct experiences but not as effective as individual experimentation; because in a domenstration the teacher takes the leading part, whereas in an individual

experimentation, each pupil gets an opportunity to handle and use apparatus and materials of science.

A modern school science programme cannot be conceived with out practical experimentation by the pupils whose practical work in connection with the theoretical discussions of a topic should be considerd an integral part of the science programme. We know that science is essentially a practical subject and that the young pupils always like doing something rather than listening or observing. Hence, practical experimentation of the principles or of the applications of science by the pupils can enable them to understand science properly. There are many facts and principles of science which are difficult for the pupiles to believe or appreciate unless they themselves do the experiments and find the truth. To cite a simple example, formation of an inverted image of an object on the other side of a convex lens cannot be appreciated easily. The pupils remain wondering until they see that the image really appears on the other side of the lens. The pupils should be given the opportunity to find the truth themselves. It may not however, be possible to arrange experiments to find the truth of all the principles they ought to learn.

### 3.5.2 Nature of Science Teaching Aids

Teaching aids are vital tools to enhance the learning of basic concepts. The teaching aids playa significant role in the science teaching learning of Visually Impired children. The difficulties encountered by child in understanding a concept can be overcome by the correct use of science teaching aids.

**The Teacher should fix his specific objectives for the task**

i) Teaching aids make teaching effective and simuntaneously make the learning interesting and profitable.

ii) Teaching aids quicken the pace of learning, foster its development and help to overcome hurdles in science learning.

iii) Teaching aids provide firsthand concrete experience to the child. One aid is equivalent to a thousand words when a child has difficulties in forming a concept.

iv) Teaching aids brings variety to the learning of the Visually Impaired child which is necessary for his/ her education.

v) A good Collection of aids motivates the teacher to teach well. The ideas involved in the aids evoke the teacher's creativity.

### 3.5.3 Characteristics of Low- Cost Science Materials

1. These are easily available either free or at low cost in local environment.
2. These do not involve specialized skills and can be made by pupils, teachers or members of the community.
3. These can easily and effectively used by the teachers and pupils in clarifying the set objectives.
4. The process involved in their production is simple and inexpensive.
5. The material is simple, accurate and appropriate to age level of the users.
6. They stimulate thinking, reacting. Discussing, experimenting or further study.
7. They are free from distractions, conflicts or bias.
8. Their production is not time-consuming.

### 3.3.4 Steps in Developing Low -Cost Science Materials

1. **Definition of objectives:** The objectives of the materials are defined in the light of the needs of users in terms of knowledge, skills and attitudes to be developed.
2. **Preparation of a design:** A design for the development of different materials is decided in terms of the type of the materials to be developed, its cost, relevance, and the resources available in the local environment.
3. **Development of materials:** The materials are developed by students, teachers, specialists or community in coooperation with each other.
4. **Pilot testing:** This is done by the teachers or researchers with selected sample users.
5. **Improvements:** On the basis of the reasults of pilot testing necessary improvements are made in the materials. This also provides a feedback for modyfying objectives and design of the materials if necessary.
6. **Finalization:** If the material is considered satisfactory after pilot-testing, it is finalized for production.

7. **Production:** Adequate number of copies ofthe final materials are produced.
8. **Distribution:** These are distributed to different schools if considered valuable to users.

**Classification of Science Materials**

1. **Free (no cost) and Easily Available Materilas:** These include things in the natural environment such as plants, animals and minerals as well as scraps/ waste from commercial and domestic use.
2. **Easily Accessible Materials:** These are available with very little cost such as masks, battery, bulbs, wire, cardboard, etc.
3. **Large Scale Distribution Materials:** Materials available for large scale distribution such as charts, models, etc.
4. **Machanical Materials:** Materials which need use of machines such as projectors, tape recoders, cameras, record players, etc.
5. **Mass Media Materials:** Materials for mass media or distant learning systems such as radio, TV, etc.

### 3.5.5 Importance of Improvisation

1. **Economic Value:** The Economic value of home - made apparatus is in line with scientific traditions to use the minimum and the cheapest of the materials to the maximum advantage.
2. **Self- Sufficiency:** Improvisation of the apparatus also contributes a great deal in making the school self sufficient.
3. **Head - hands Co- ordination:** In the case of young children the understanding travels from hands to the head. The Co - ordination of hands and head is important for better understanding. This forms the basis of home -made apparatus.
4. **Knowledge of Principles:** The pupils handle the apparatus prepare models etc. and get a deeper and wider knowledge ofthe whole principle or working underlying a particular apparatus which would otherwise have been impossible to attain.
5. **Creative Hobbies:** The co -ordination of hands and head and the overall confidence that pupils acquire by constructing some model or apparatus may lead to develop some creative hobbies.

6. **Creative satisfaction:** The constructive and creative instincts of pupils are satisfied. The thrill and joy of having created something give them a sense of achievement. This may enthuse children to utilise their energies in the exploration of some new things. Their energies find fruitful channels of sublimation at the adolescent stage.
7. **Exercise and development of In genuity and Resourcefulness:** The pupils find a new media for the application of their knowledge. They learn to think critically and improve their work criticism and auto-suggestion. They form the habit of thinking scientifically. They are instilled with the sprit of emulation to find something new.
8. **Use of Leisure:** The problems of leisure and indiscipline are solved to a great extant.
9. **Creating confidence:** while improving the apparatus the pupils feel the difficulties that the scientists had faced in inventing some apparatus. This encourages the students to face the problems boldly and with confidence and develop independence of thought and self- reliance. It also provivdes for individual differences and the students work with their own pace.
10. **Dignity of labour:** When the pupils work with their own hands, they develop dignity of labour. They love to work with their own hands. This removes the barriers between the mental and manual labour and thus contributes much in placing the pupils on socialistic pattern of society. As a reasult of improvisation the habits and attitudes formed are applicable in the daily life of the child outside the school.

### ii) Locating and procuring Science equipment

### Apparatus and Materials

The terms, principles, their applications and the materials of science become more meaningful by actual use. Hence the need for practical work in science. Many important principles, laws and generalisations of science will remain abstract to the pupils with out practical demonstration or individual experimentation. They will simply learn to memorise them with out understanding. Practical work thus makes science meaningful.

A long talk, however interesting it may be becomes boring for the young pupils. They do not have the patience to listen or pay attention to a particular activity for

a long time. They need diversion. Practical work in science provides for this. The use of apparatus and materials for performing a demonstration experiment or doing individual and group practical work breaks the monotony of classroom teaching, introduces variety and provides motivation for learning science. A dramatic situation may be created in the classroom or in the laboratory by performing an interesting demonstration using scientific apparatus and materials. Many lessons can be made effective by starting lesson with an interesting demonstration. A well- planned use of the apparatus and materials of science can never make the science class dull.

It is psychologically sound to provide for individual differences. One of the important advantages of using apparatus and materials is that there are possibilities for providing for individual needs and interests. All pupils are not equally benefited from reading books or attending class teaching. Some pupils have inborn abilities for handling scientific gadgets and doing experiments. The availability of apparatus and equipment provides them scope to exibit their merit. It is a common experience that many pupils like to make radios, cameras, and simple machines. This attitude is strengthened when they see apparatus and equipment in the science room or the teacher demonstrating with apparatus or while the pupils themselves do experiment. Thus apparatus equipment contribute to the development of talent.

Apparatus and equipment are necessary to train the pupils in scientific method. It is through the use of apparatus and materials that we can train the pupils in accurate observation, collecting data or evidence, ana lysing the data, making hypothesis and testing it, selecting useful and consistent evidences and drawing a conclusion. Setting up an experiment for a problem at hand or even sensing a problem, taking necessary precautions and care, and developing manipulaive skill in handling apparatus and materials are possible only through actual use of apparatus and materials. To develop critical thinking or scientific thinking, experimentation with apparatus and materials is necessary.

Performing experiments with the help of apparatus and materials at the school stage will help the future scientists to investigate difficult problems in their later carrier and enable them to undertake original work independently. Another purpose for which the use of apparatus and materials is advised is to provide an environment to pupils for exhibiting initiative, resourcefullness and co-operation. These qualities enrich their personality. Field trips, pupils' projects also given an opportunity to develop these qualities. But doing experiments using apparatus and materials is an essential means of developing these worthy qualities, students initiative and resource

fullness are necessary for handling apparatus and materials for setting up an experiment, arranging for a demonstration or a project. Sometimes pupils have to improvide, adjust and repair parts of an experimental arrangaement. Group work helps developed co-operations, friendship, mutual understanding and sociability among them.

**Advantages or value of Improvised Apparatus**

For demonstrationm and experimentation, a large quantity of materials and eqipments are needed in a science Laboratory. The cost of this material and equipment is high and it becomes difficult to arrange for it from the nominal amounts available at the diposal of science teacher. However, a teacher with strong determination and necessary skills can go ahead with the task of improvising apparatus and equipments. Home - made or improvised apparatus are made from very low cost raw materials, with the help of students under the guidence of the teacher.

The improvised apparatuses made by the students prove quite beneficial from so many angles summarized as below:

**1 Economical Value.** Improvised apparatuses are infact low or no cost apparatuses as these are made by the students themselves with the help of costless waste material, household articles and low cost material. The finances of the institution to be spent on the purchase of the costly scientific apparatus and equipment thus can be saved or reduced with' the help of improvisation task undertaken by the students. The day to day expenditure incurred in term of the repair and maintenance of the apparatus and equipments may also be saved as the improvised apparatus and equipments can be easily repaired and safely maintained by the students themselves involving almost no expenditure.

**2. Psychological Value** From psychological point of view also the task of improvisation prove quite beneficial to the students as it :

* Satisfies their basic instincts and urges like instinct of curiosity, constructiveness, and inventiveness etc.

* provides opportunity for self- expression and self- development meeting out their natural interests and aptitudes.

* proves an appropriate means for the healthy canalization of their pent-up emotions and creative energy.

3. **Educational value.** Improvisation is also quite advantageous from the educational point of view on account of the following reasons:

* It provides opportunity for making best use of the principle'learning by doing' and integration of the three H's. i.e. hand, heart and head.

* It provides proper opportunity to make a practical and applied use of the theoretical knowledge of the scientific facts and principles.

* The improvised apparatus besides proving convenient and simple in use has a strong psychological appeal in terms of emotional attachment and thus is able to create genuine interest in making use of it for the learning and exploring the scientific facts.

4. **Inculcation of scientific attitude and abilities.** -

In case the students have devised and are using the apparatus made by them it is sure to lead them in the development of the following attitudes and abilities linked with the study of sciences:

i) Development of scientific attitude and acqusition of scientific method of problem solving

ii) Proper development of the mental faculties like reasoning, thinking imagination, analysis, synthesis and evaluation, etc.

iii) Development of the faculty of self-criticism, self- appraisal and self improvement.

iv) Development of independence of thought, self- reliance and self- confidence in one's abilities.

v) Development of ingenuity, inventiveness, creativity, resourceness and constructive or designing faculty.

5. **Entertainment value:** The students derive great joy and happiness when they succeed in making, designing or inventing something by their own efforts. Moreover devising an apparatus may be taken as a hobby and thus' may provide a lot of refreshing as well as recreational value especially in terms of utilising one's leisure hours.

6. **Social Value. :** By undertaking the improvisation activities students learn the habit of working with their own hands. It .graduallv helps them in realising the dignity of labour and developing a positive as well as healthy attitude towards manual work and also towards those who earn their breads by doing manual

work. These habits and attitudes so developed are very much useful to them in leading an industrious life and narrowing the cleavage between the intellectual and manual labour.

7. **Proper upkeep of apparatus. :** Everybody has a deep attachment for the things of his own creation. Therefore, when the students improvise their own apparatus for being utilised in the teaching and learning of science, they naturally develop an attachment and feelings for the safe use and proper maintenance. Gradually it is developed into a general habit of proper caring and maintenance of all the equipments and apparatuses whether improvised by them or otherwise kept in the laboratory.

8. **Search for scientific talent. :** When students start thinking about devisi ng their own apparatus for conducting experiments, their creative faculties begin to function to such an extent that they do not only copy the original plan and technology for making some suitable and cheap apparatus but also invent and innovate many things quite new and original. In this way, the opportunity provided to the students for improvising science apparatus may be utilised for the search of scientific talent among them.

## 3.6 Problem solving and learning by doing approach for visually impaired students

If science is poorly taught and badly learnt, it is little more then burdening the mind with dead information, and it could degenerate even into a new superstition.--- Kothari Commission.

The method of teaching science as prevalent today in our schools. Different methods of teaching have been proposed or profounded by different educational thinkers or schedule of thought in education. It is but desirable for the student to know about all of them. So that he can make a rational choice for himself. The knowledge of procedures, merits and demerits of all the methods will broaden the outlook of a would be teacher. The choice for him is not to be made narrow. It should be then left for him decide from his vide information.

**Problem Solving Method:**

Problem solving method as a method of teaching represents a method which provides opportunity to the pupils for analysing and solving a problem faced by him on the basis of the previous stock of his knowledge enriched with the present means available to him.

**Definitions of Problem Solving**

**1) According to Woodworth and Marquis:**

Problem solving behaviour occurs in novel or difficulty situations in which a solution is not obtainable by the habitual methods of applying concepts and principles, derived from past experience in very similar situations.

**2) According to Ausubel :**

* Problem solving involves concept formation and discovery learning."

**Steps (procedures) in Problem Solving**

The commonly used steps or procedure for finding a solution to the problem are as under:

1. Statement of the problem
2. Collection of relevent information or data
3. Analysis of the collected data or information
4. Formulation of hypothesis or tentative solutions.
5. Selection and testing of a proper solution
6. Drawing Conclusions.

**1. Statement of the Problem:**

The first step in problem solving should be selection or identification of a problem. The choice of a right type of problem which is related to the level and the needs of the students is most important. Students often come across numerous difficulties, questions, doubts and problems, the ansawer to which they do not know or canot find out from the books. The problem should be stated in clear, simple, exact and unambiguous works.

**2. Collection of relevant information or data:**

After statement of the problems the students are encourages to collect information relevant to the problem from available records or through consultation of books and literature from the library or through any other means available to them. Here the needs of the proper guidance and help from the teacher arises and it should be available to them in proper degree at the proper time.

**3. Analysis of the collected data or information:**

The information or data collecetd is analysed in the light of finding out possible solution of the problem in hand. The data or information which is superfluous or irrelevent or not helpful in the solution of the problem is abandoned and the relevent or useful ones is taken for being used in the solution of the problem.

**4. Formulation of hypothesis or tentative solutions:**

A hypothesis is the probable solution for the problem in hand. There can be a number of predictive or tentative solutions for a problem. After statement of the problem and collecting the relevent data, the important stage is to formulate some tentative hypotheses.

**5. Selection and testing of a proper solution:**

Out of the possible tentative solutions or hypotheses, the attempts are made to search out the best. For this purpose all the hypotheses are taken by one by one discussed and weighed in terms of their validity and practicability. The selection of the most relevent hypothesis out of the so many hypotheses is made quite cautiously.

**6. Drawing Conclusions:**

It is the last step of problem solving in which the given hypotheses are accepted, rejected or modified, if the experiments and observations made in the light of set predictions prove particular hypothesis, then that is accepted. In case there are negative results for a prticular hypothesis, it is rejected. If any hypothesis is neither proved nor disproved, rather some exceptional results are observed it is modified in the light of that observation.

**Merits**

1. Problem solving method helps in stimulating thinking
2. It helps in developing good study habits.
3. It develops reasoning power

4. It helps in stimulating thinking
5. The students learn to be self-dependent
6. It helps to improve knowledge.
7. It affords opportunities for participation in social activites
8. The method provides opportunities to the teachers to know in detail their pupils.
9. Knowledge is easily assimilated as it is the reasult of a purposeful activity
10. It gives the power of critical judgement
11. It helps to learn how to act in a new situation
12. Students learn facts which are meaningful and which have been discovered by their own efforts.

**Demerits**

1. It involves a lot of time and the teachers find it difficult to cover the prescribed syllabus.
2. There is a lack of suitable reference and source books for children
3. Problem method needs very capable teachers to provide effective guidance to students
4. Generally speaking problem-solving involves mental activity only. There is less of bodily activity.
5. Small children do not possess sufficient background information and therefore, they fail to participate in discussions.
6. Through this method, the teacher lays stress on experimentation at the cost of other important aspects of Science teaching.

### 3.6.1 Learning by doing Method

Different methods of teaching have been proposed or performed by different educational thinkers or schame of thought in education. It is but desirable for the student to know about all of them. So that he can make a rational choice for herself. The knowledge of procedures, merits and demerits of all the methods will broaden the out look of a would - be teacher. The choice for him is not to be made narrow.

It should be then left for him to decide from his vide information.

Most teachers and trainers seem to believe that pupils learn best by doing. But how is this rather general belief to be put into practice? In particular:

> What ideas or theories are there to help us to explain and justify the belief that we learn best by doing?
>
> Does everyone learn by doing in the same way or to the same extent?
>
> What teaching and learning methods are there for us to use which involve learning by like?
>
> If our courses are redesigned to involve more learning by doing, what might they look like?

How is it possible to change our teaching to involve learning by doing when we are surrounded by constraints?

'Learning by doing', and the term 'experiential learning', are commonly used to refer to several different aspects of learning. This guide is not concerned with the assessment of 'prior learning' : learning experiences which have taken place before learners enrol on courses and which are taken into account in the assessment of the course or the granting of exemptions from course Components.

### 3.6.2 Learning by doing/ Experiential learning theory

It is common for courses to be described as either practical or theoretical : as either involving doing or involving thinking. Learning is seen to take place either 'on the job' or in the classroom'. Even in courses which contain both elements they tend to be sharply divided. An academic teacher may present theory in a lecture in the classroom whilst a practical supervisor is in charge of the follow- up practical experience in a workshop.

It is not sufficient simply to have an experience in order to learn. Without reflecting upon this experience it may quickly be forgotten or its learning potential lost. It is from the feelings and thoughts emerging from this reflection that generalisations or concepts can be generated. And it is generalisations which enable new situations to be tackled effectively diagram.

Similarly, if it is intended that behaviour should be changed by learning, it is not sufficient simply to learn new concepts and develop new generalisations. The learning must be tested out in new situations. The learner must make the link between theory

and action by planing for that action. Carrying it out, and then reflecting upon it, relating what happens back to the theory.

It is not enough just to do, and neither is it enough just to think. Nor is it enough simply to do and think. Learning from doing must involve links between the doing and the thinking. The four stage model of learning by doing which is elaborated below is that of Kolb. Quite a few theorists have proposed cyclical models to explain how people learn from doing, but they all share the important features of Kolb's Model which itself derived from Lewin. Learning from experience involves **four stages** which follow each other in a cycle, as in the following diagram.

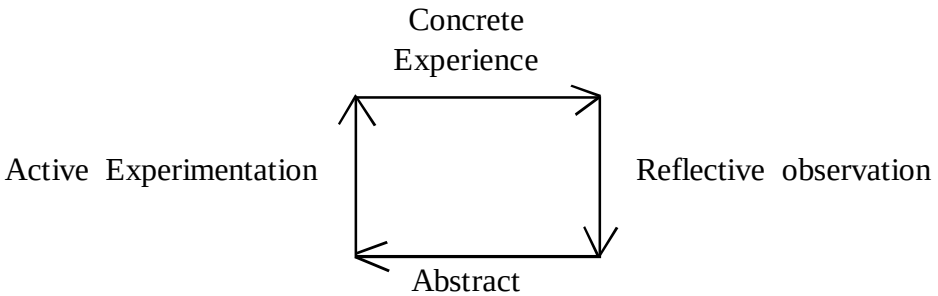



Fig : 1.1

The terms used here as labels for the four stages come from Kolb's Experiential Learning Theory, and placed in this sequence they form the experiential learning cycle.

### 3.6.3 Learning style

Just as courses may be seen to be either mainly practical or mainly theoretical, so individuals may have particular preferences in their larning. While one person might prefer to formulate plans and define potential problems, another might prefer to get on and carry out the plans. There are distinct learning styles associated with each of the stages ofthe learning by doing cycle.

These differences in style were illustrated graphically in a computing course. At the start of this computing course the students were set an open-ended computing problem to work on alone over the next four weeks. They then met to compare solutions to the problem, but also to compare the different ways in which they went about working on the problem. Three of the students displayed dramatically different styles.

**Student A** went straight to a computer keyboard and started keying in segments of a program. She did't analyse the nature of the problem. As soon as it became apparent that the programming routines being written did't work, new routins were written out and immediately tested in a trial and error way: mostly error. This student had created dozens of programming routines, none of which got close the solving problem. She seemed not to learn from her mistakes.

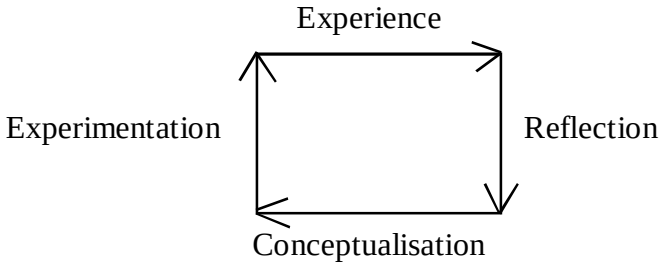
**Student B** Appeared to start off like student A, going straight to the keyboard. He selected a procedure which he knew and implemented it. He wrote an extensive, detailed and complete programme which ran successfully, but which solved a problem quite different from the one which was set. He was unaware that he had tackled the wrong problem because he was so busy getting on with the task.

**Student C** Became intrigued by the problem itself and its underlying features. She started reading about this kind of problem and the reading led her into related areas which also contained intriguing problems. She could talk animatedly about the topic in general in an abstract way but had't even started writing any programming code to produce a solution.

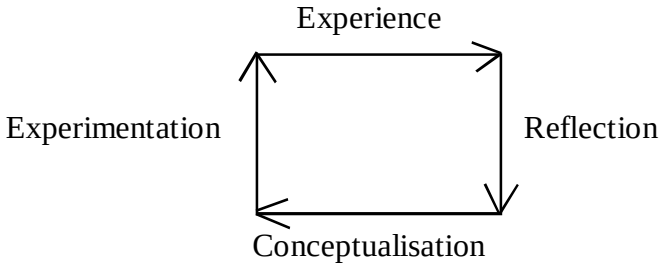
In terms of the learning by doing cycle these students were stuck at one part of the cycle to the virtual exclusion of the other three.

### 3.6.4 Practical Methods to implement the learning by doing cycle

**3.6.4.1 Planning for experience:** This section is concerned with methods for preparing learners prior to experiences so that they make the most of those experiences: for example through action planning and the negotiation of learning contracts.




**3.6.4.2 Increasing awarness of experience :** This Section is concerned with methods for heightending learners awarness of thier experiences so that they notice more and have more material upon which to reflect afterwards: for example through the use of log books.




**4.3 Reviewing and reflecting upon experience:** This section concerned with what happens after learning experiences and how learning points can be drawn out through structured reflection: for example through the use of video recordings and self assessment.

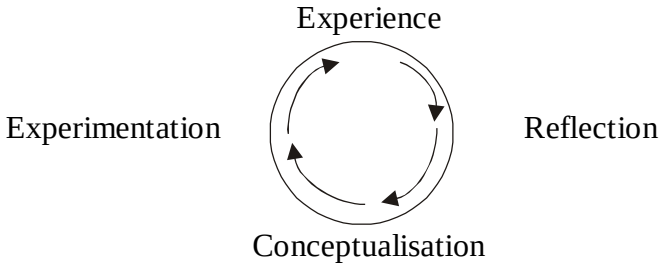



Fig 1.2

## 3.7 Evaluation procedure with particular reference to Practicals and adaptations in Examination questions

Evaluation is an integral part of teaching. It is as essential to the teaching process as the content and method of communicating the content. In fact, effiectiveness of teaching among other things, depends on the quality of evaluation and its utilization for improving the teaching-learning process.

**Concept of Evaluation**

The goal of education is all round development of the child. It is all round development that makes a human being. It implies that education should contribute to cognitive (Knowledge), affective (feelings, emotions, attitude and values), and psychomotor (skills) development of the child. Teaching is the process through which this educational goal is realised. Evaluation is a mirror which reflects the extent to which teaching objectives are achieved. Evaluation therefore has to be comprehensive. Comprehensive evaluation, as envisaged in the NPE programme of Action, implies that it should encompass all aspects of teaching objectives.

Teaching is a continuous activity. So evaluation is required to assess the pace of pupil progress, identify learning problems, and taking teaching related decisions. By implication, evaluation is also a continuous process. The continuity of evaluation is essential for evolving effective teaching. In this way evaluation can be a day to day, lesson to lesson and unit to unit process. It is also known as formative evaluation. It assesses immediate teaching out come. The evaluation at the end of a term, a grade or a stage of education is known as summative evaluation. The word summative represents cummulative evaluation.

## i) Evaluation Procedure with reference to Practical

### (a) Way of learning science: Practicale

One of the foremost methods by which children learn science is through first-hand experiences. Even in the primary standard,whenever a teacher is trying to demonstrate or explain a concept, it is useful for her to have materials which show or display that action or system or method. The visually impaired child sometimes needs special opportunities for tactually exploring or having careful, prior explanations of, or follow-up information about. But first-hand experiences should be correlated with helping children to recall what they have experienced, and making deductions from them.

The second way is that the young children enjoy first-hand experience by undertaking field trips. A field trip to an industry, visits to the neighbourhood and community are useful in stimulating awareness of the environment. There are many things that primary level children can do in which thay can be active during group excursions and field trips. During field trips, the children need to know what they are looking, they need to be oriented to what to expect, during the field trip. On their return, they should be asked to correlate their experiences with the lessons. This will help visually impaired children to develop concepts through first hand experiences.

### (b) Teaching Laboratory Sciences to Visually Impaired Children

Authentically and generally, it has been largely admitted by teachers in the field of education of the visually impaired that methods adopted in instructing normal sighted children can be applied to the teaching of visually impaired children with accurate and precise modifications of the material. But it is a stupendous task to. make visually impaired children understand ideas of physical and biological sciences. However, it should not be ruled out for these children because they are blind. Classroom

teaching or laboratory methods which are often conventional, can partly or seldom be wholly followed by visually impaired children.

### (c) Role of Experiments in Learning Scientific Concepts

Laboratories are for the child's learning by doing. As a matter of fact, learning will never be complete if the child is just stuffed with the mere theoretical aspects of topics. Visually impaired children have the ability to perceive water boiling, evaporation of water and the like. In a laboratory, once the child attains the ability to pour water into a test tube, he can be given the confidence to use diluted acids in experiments. By the time the experiments with such diluted acids are performed by the Visually impaired child for himself, the student will be ready to start the examination of diluted acids. In all circumstances, the earnest attempt should be made to explore the possibilities for the visually impaired children in laboratories, rather than to avoid such experiences.

At the high school level, it is usual to group children for experiments in the laboratory. While one child performs the experiment, another child is engaged in recording the reasults, yet another is engaged in observing the experiment. Therefore this is group learning. The children put all the facts together and present the experiment report. A visually impaired child can be made a member of such team and share the responsibility suitable to him.

## ii) Evaluation Procedure for adaptations in examination questions.

### a) Functions of Evaluations

Evaluation is purported to perform several functions in teaching. It helps in the assessment of pre-requisites of the new learning tasks available with the learner. For example, for the learning of addition, the pupil should already have developed the concept of numbers and their position on the number line. For teaching the law of gravitation, it is ensured that the pupils have learnt the concepts of mass, acceleration, force and the relationship among them. It is used to assess the progress of learning the extent to which a particular child has learnt the new task. The progress of learning is always in relation to the teaching objectives.

There are times, when the criteria of performance of the new learning task are not acheieved.

In otherwords, the progress of learning is not satisfactory. In that event, it is imperative

to diagnose the cause of shortfall. It requires diagnostic evaluation. It helps in designing remedial measures to achieve the desired level of performance. Evaluation is used for the improvement of Teaching. The diagnostic evaluation is both for the teacher as well as the pupil.

**b) Evaluation Procedure and Tools**

Evaluation data are collected through different sources. Informal evaluation in usually in progress when the teacher asks questions during the lesson or observes child behaviour in some solutions incidentally. For formal evaluation several systematic procedures are followed. Test can be written, or oral or a combination of both. The tests can be normative which are standarised. Through these tests the child's performance is considered in relation to the group of children on which the test has been standerised. The tests can also be criterion referenced tests. These tests pertain to the performace of the child on the content covered . These tests are very important for feedback on learning and improvement of teaching procedures. Systematic observation of child's behaviour is required for evaluating his performance in setting up experiments and his behaviour in social situations. Testing of manipulative skills is done through evaluation of the child in practicals. For example, setting up of science experiments" physical education, etc.

Several types of questions are used in evaluation tools. The questions can be considered from the point of view of length of the answers expected. Very short Answer Type questions require answers in one or two words. For example: where was Gandhiji born? Name the capital of United Kingdom.

Short answer Type questions require answers in 20-25 words. For example: Define social stratfication in about 25 words. Essay type question can require answers of any length depending on the nature of content and developmental stage of the learner. For example:

Explain in about 200 words - water cycle in nature illustrating with a disgram. Compare the parliamentary form of Government in USA giving atleast four points of difference and four of similarities in the two systems. Write an essay on National Integration in about 500 words.

**c) Adjustment and adaptations for Visually Impaired Children**

The adjustment and adaptation of evaluation and examination procedures can be

viewed from the point of view of the medium of presentation of test items and the modalities of answering by the visually impaired children. The issues and practice needs to examined from the point of view of blind children; and low vision children. The guiding principle is that the procedures should be as close to the practice with sighted children as the handicap permits. As in the case of curriculum, in evaluation and examination procedures also; substitution and omission are the last resort. The purpose of adjustment and adaptation is that the visually impaired child should not be at disadvantage in evaluation and examination due to his handicap. This section though not prescriptive, presents alternative approaches and preferred modes for the two groups of children.

**d) For Blind Children**

Blind children here are those children who can read print and use braille reading. What are the ways in which questions can be communicated to these children and how can they answer. The possibilities can be :

| Question Mode | Answering Mode |
|---|---|
| 1. Writen in Braille. | 1. Writes himself in Braille |
| 2. Written in print but read by a Reader for the blind | 2. The scribe writes for him |
| 3. Listening by the blind child from Audio cassette player | 3. Records on audio cassette. |
| 4. Direct questioning orally by the examiner. | 4. Tells orally to the examiner directly |
| 5. Combination of the above. | 5. Combination of the above. |

**e) Questions in braille and self answering in braille**

It is the ideal mode as there is no intermediary between the examiner and the examinee. The child feels responsible for the omissions and commissions. But there is a problem in this mode. Braille reading and writing takes more time print reading. Should the blind children be allowed more time for answering the questions in braille? The obvious answer is - yes. It is also being provided in some cases.

Those who are well exposed to the practice of braille reding and writing, will agree

that it cannot be uniform accross grades and subjects. It depends on the minimum level of competence of braille reading and writing. It also depends on the nature of the subject matter. For example, the answers requring diagrams as in Mathematics and Science will require more time than simple explanatory braille. No empirical evidence is available about the period of extra time to be allowed for the blind student. Even if the empirical evidence is available and one likes to provide the desired extra time, the child will feel fatigued. The child be allowed a brief rest of 10-15 minutes during the test if extra time for writing in braille comes to about one and half time more than what is required by the sighted child?

**f) Use of scribe**

The blind child is provided a writer in this modality. Here the scribe reads the question, the blind child dictates and the scribe writes the answer. The print and cursory writing scripts are used. This modality is also being followed in many cases. The blind child when scores low he attributes the cause to the failure of the scribe to write correctly. Then there are a lot of problems relating to the selection of the scribe. The blind child would like to to bring a scribe of his choice. While some boards insist on providing a scribe of their choice to ensure that the level of knowledge of the scribe is not above than that of the child. The boards want to appoint a scribe one class below the level of the blind examinee. The blind child invariably finds himself at a disadvantage. Bright blind child remains at much disadvantage if the scribe fails to reproduce with the examinee's speed and correctness.

**g) Audio-recorded questions and audio recorded answers**

This mode is not yet tried out, but seems to have a lot of potentiality. However this mode may not suit for language tests where spellings are also evaluated. For tests requiring evaluation of spellings, the first mode is ideal. This mode has another limitation. The questions and answers involving diagrams may not be amenable to this modality.

**h) Oral Questions Oral Answers**

This modality is also in use. It is in use in informal evaluation in the class- room. It is also in use in oral examination and practicals. Its scope and purpose are limited. The modalities suggested in this subsection present alternative modalities. It is not desirable to conform to one modality. The modality is to be selected taking into

consederation the objectives, content and level of the pupils. In examination the modality using the scribe is the least desirable. A combination of other modalities should be preferred. The curriculum, evaluation and examination should be viewed from the angle.

**i) Low Vision Children**

Low vision children are those who need large print reading material. For reading, they need large print. They can write like other sighted children but can't read their own handwriting. This they can achieve through training. They need magnifying glasses or spherical lense for reading. These children can be provided question papers in large print or/and magnifying glasses. As there is little facility for education of these children in general schools, these children also find their way into schools for the blind where they are subjected to teaching, evaluation and examination procedures meant for the blind. They are also provided scribe. They are forced to reading and writing braille which they resist.

**j) Questions in large print and answers in cursive writing**

It is possible to provide the question paper 18 or 36 point. It will be costlier as the number of such children may be very small. If a photocopier, with enlargement is available, it is possible to prepare copies of the same questions papers. The child can write answers questions in large print are made available. But he will not be able to correct the mistakes like other children who glance through their answers, if time permits. It is possible if magnifying glass or/and spherical lense are available. The problem can then be offset. The low vision child may require extra time for reading and writing than children with normal sight. The extra time to be allowed can be worked out on the basis of empirical evidence.

**k) Audio recorded questions and answers in cursive writing**

The questions can be recorded on audio cassetes if large print facilities are not available. Enlarged diagrams, whereever required, can be got made and instructions regarding the placement of diagram provided in the audio cassettes. Answers can be in cursive writing.

**l) Audio recorded questions and audio recorded answers**

As indicated in the subsection relating to adjustment and adaptation of evaluation

and examination procedures for the blind, the content and objective not requring emphasis in spelling can be evaluated through this modality.

The evaluation and examination procedures can be adjusted for this group of visually impaired children through the use of alternative modalities.

## 3.8 Let Us Sum Up

The aims of teaching and study Sciences are to encourage and enable students to develop inquiring minds and curiosity about Science and natural world, develop skills of scientific enquiry to design and carry out scientific investigations, think analytically. The objective of science education refers to enabling students to understand the interdependence between science and society.

At the end of the Course and within local and global contexts students should be able to describe and discuss ways in which science is applied and used to solve local and global problems, recognize and recall scientific information, analyze it, carry out scientific investigations.

So Science education at any class must not only depend on text books. Hands on training and experimentation are necessary so that learners can visualize the things, interpret it and understand. There is no role of mechanical learning.

## 3.9 Check your progress:

i) Identify the needs of Visually Impaired children in Learning Science at Seconday stage

ii) Explain the difference steps of Problem Solving Methods

iii) What is Evaluations? Write in brief examination procedure for Evaluating Science for Visual Impaired children

iv) Explain the importance of of TLM for teaching Science for Visually Impaired children.

## 3.10 References

l) Sing S.P : Research Methods in Social Sciences

2) Suresh K.P, Joseph Celene: Teaching and Testing Science Process Skills

3) Prakash Ravi, Ratho T.N : Emerging Trends in Teaching of Chemistry
4) Das R.C : Science Teaching
5) Sing Yogesh Kumar, Ruchika Nath : Teaching of General Science
6) Mukhopadhay Suresh, Jangira N.K, Mani M.N.G and Raychowdhary.M : Source Book for Training Teachers of Visually Impaired Children
7) Mittal S.R. : Education of Children with Low Vision
8) Singh A.K : Teasts, Measurement and Research Methods in Behavioural Sciences
9) Lowenfeld Berthhold : The Visually Handicapped child in - School
10) Burgara, N.C : Visually Handicapped & Learning

# Unit - 4 ❑ Social Science

**Structure**


**4.1 Introduction**

**4.2 Objectives**

**4.3 Techniques of Preparation and Presentation of Adapted Tactile Maps, Diagrams and Globe**

**4.4 Procuring, Adapting and Use of different types of models**

**4.5 Organizing Field Trips**

**4.6 Teaching Skills: Dramatization, Narration, Explanation, Story-telling and Role Play**

**4.7 Evaluation of Concepts and Skills in Social Science with particular reference to Geography**

**4.8 Let us Sum Up**

**4.9 Check Your Progress**

**4.10 References**


## 4.1 Introduction

Visually impaired (VI) learners' needs and goals for learning and education are not different from those of the general learners. It is only the means of achieving these goals are different, though the content materials and subject matters are the same as those for the seeing learners. Lowenfeld (1959) has aptly said, "Education has aim at giving the blind child knowledge of the realities around him, the confidence to cope with these realities, and the feeling that he is recognized and accepted as an individual in his own right."

In reality, if the VI children are exposed to the educational experiences and materials as used to the sighted children, they would not be able to satisfy their needs or to achieve the educational goals properly. Since normal educational experiences are approximately 85% visual, it may be easily imagined that the extent of difficulties the VI or blind children are to face only because of their visual problems. In order to make them capable

to receive educational inputs appropriately, the adapted alternatives, especially for the VI children should be developed. The obvious alternatives may be of many types. The special methods, materials and equipment can be employed utilizing the sense organs of touching, hearing, smelling and even tasting. Therefore, the curriculum for the VI students should include:

- Adaptations to the general teaching-learning materials,
- Use of some specialized models,
- Specially designed teaching skills with field trips for learning of the VI learners,
- Special evaluation planning for progression of concept and skill learning of the VI learners.

## 4.2 Objectives

After the completion of the Unit, learners would be able to-

- Acquire necessary techniques of preparation and presentation of adapted tactile TLM for Social Science;
- Adapt different types of models for teaching Social Science suitable for VI students;
- Organize field trips for VI students;
- Acquire different skills for teaching Social Science suitable for VI students;
- Evaluate concepts and skills in Social Science with Special reference to Geography.

## 4.3 Techniques of Preparation and Presentation of Adapted Tactile Maps, Diagrams and Globe

Tactile aids provide information to the VI individuals through the sense of touch. These may include Braille Materials, Braille marked tools or Adaptive aids like Tactile maps, Diagrams and Globe. Like printed materials, Braille materials are read with the fingertips reproduced by transcribers, publishers and printing houses. Braille markings are found on adaptive aids such as rulers, measuring cup and clocks in place of printed letter or numbers. A Braille-writer is six-key typewriter for typing Braille. It produces raised dots onto specially designed, heavy Braille paper.

### 4.3.1 Preparation of Adapted Tactile Maps, Diagrams and Globe

The slate and stylus are writing tools used to write on Braille. The user places a sheet of Braille paper between the two metal plates of the slate. The stylus, a short metal prong fastened to a handle is held to the palm and pressed downward onto a paper within an open window. A raised dot is formed on the reverse side of the paper. The writing is read when the paper is turned over and dots are facing upward.

Templates and writing guides are frames used in writing on lines or in specified spaces. Window openings in the templates serve as a guide for signing checks or writing letters. Raised line paper is writing paper with embossed lines to enable the user to follow a straight writing path.

Paperless Braille or cassette Braille is an information system that is stored on audio cassette tapes and accessed in Braille. The user runs his/her fingers over display cells to read the text and pushes a button to access the next segment of recorded material. The user can produce, edit and record Braille with the system. It can be adopted for use with computer terminals, calculators and type writers.

The raised line drawing kit is a board covered with a soft underlay of rubber. The user places a sheet of acetate over the board and draws on it, creating raised lines and an embossed picture.

Tactile colour is a standardized system of 12 distinctive colours; each is assigned a specific texture. This allows visually impaired persons to better participate in creating or enjoying visual artwork. It is also useful in map-making, for labelling and as an educational resource.

A Thermoform machine is a device that heats a sheet of plastic paper so that it may be moulded to whatever shape is placed beneath it. Thermoform machine can produce copies of Braille and also be used to create raised line maps or graphs.

Tactile maps and globes are three-dimensional maps that are used as an orientation aid. They contain raised surface, textures, and Braille markings and are designed to be read with the fingertips, in a manner similar to Braille.

Tactile Graphics, including tactile pictures, tactile diagrams, tactile maps, and tactile graphs, are images that use raised surfaces so that a VI person can feel them. They are used to convey non-textual information such as maps, paintings, graphs and diagrams .Tactile graphics can be seen as a subset of accessible images. Images can be made accessible to the visually impaired in various ways, such as verbal description, sound,

tactual feedback. One of the most common uses for tactile graphics is the production of tactile maps.

**(i) Basic Principles for Preparing Tactile Graphics**

Tactile graphics are essential components of Braille materials transcribed for use in educational and professional fields. Guidelines and standards for inclusion, design, and presentation of tactile graphics are found more necessary today with the advent of electronic text production and the proliferation of diagrams, illustrations, and graphs in educational texts:

- A tactile graphic is a representation of a print graphic designed in a manner that is the most meaningful to the reader. It is not an exact reproduction.
- The Braille code and format used in preparation of the tactile graphic must be consistent with the transcription of the main body of text.
- Many frames or image outlines found around print diagrams should also be omitted if they add extra lines without purpose. At times, image outlines are required to indicate containment such'as water or land areas on a map.
- The tactile graphic should be positioned near the left margin of the page or indented according to the Braille code in use, rather than cantered. A blank line is required before and after the tactile graphic.
- A print graphic may be simplified as far as the original intent not being compromised.
- If the task does not involve measurement, modifications to size, position, or layout may be made to an illustration to clarify presentation.
- If the concept of depth is not required, a 3-dimensional view should be changed to a 2- dimensional view.
- If the reader is required to measure a line or an object, the line or object should not be lengthened or enlarged and must be raised and designed in a way that permits measurement with a Braille ruler. If the reader is required to measure an angle, the rays should be extended.
- If the reader is required to measure distance, the scale and graphic must be revised proportionately.
- Use transcribers notes to explain changes made to the print format.

- A combination of symbols, keys, and words may be used to convey information. Since the use of a key involves an extra step for the reader to interpret the graphic, use a Braille label (word) instead of a keyed symbol when it will fit in the available space.
- Maintain consistency throughout a transcription when assigning alphabetic keys and/or textures to a particular item.
- The age and experience of the reader must be considered when designing a tactile graphic. Based on the student's skill level, it may be necessary to limit the number of key symbols when assigning areas, lines, and points.
- Consider placing the tactile graphics on a separate page with limited text so that the graphic may be used with electronic text (e-text), as a tactile graphic supplement, or added to a collection for future use.

Tactile graphics should be developed as distinct as possible keeping in mind the Braille reader's point of view. It is up to the teacher to present the information in a clear and concise manner for the VI student. If the original shapes and textures are necessary to convey the concept, or can simple geometric shapes or Braille signs be used to illustrate the concept omitting the unnecessary parts of the diagram (i.e. unreferenced or irrelevant sections of a map) so that the original shapes and textures can be presented on a larger and clearer scale. If the text requires measurements to be made or an operation to be performed: or if the original shapes, textures and total form are necessary to convey the concept, the lines and angles are reproduced retaining a proper scale. Edit! proofread the graphic with fingers, not with eyes and if someone says the graphic is 'pretty' or 'beautiful', take a second look, students may not be able to understand it.

**(ii) Tactile Maps**

The use of maps is an important skill for all children to learn. For students who have visual impairments, learning to read a map is an important step towards his/her independence, as well as a way to participate more fully in the regular geography and social studies curriculum. This section offers suggestions on how to teach students to use tactile maps, from the most basic object books to more complex tactile graphics. According to Jacques Bertin, "Tactile map variables can help in determining how visual maps are to be produced; tactile maps have a formula as well. Although researchers have not standardized tactile map variables, these are usually included depending on the substrate - vibration, flutter, pressure, temperature, size, shape, texture/grain, orientation, and elevation."

(a) *Attaching Objects on Paper:* The types and forms of tactile maps began with the oldest and most rudimentary or a mixed media format. This tactile map is produced by simply attaching objects to a substrate to represent different items or symbols. More recent tactile maps are produced by computers through different means such as ink-jet printers.

(b) *Thermoform* is one of the most common methods of producing tactile maps. This process is also known as vacuum forming. Thermoform maps or plans are created from a process where a sheet of plastic is heated and vacuumed on top of a model or master. The master can be made from many substances, although certain materials are more durable than others. Since this process involves creating a mould, it is somewhat time consuming.

(c) *Swell paper* has a special coating of heat-reactive chemicals. Microcapsules of alcohol implanted in the paper fracture when exposed to heat and make the surface of the paper inflate. Placing black ink on the paper prior to a heat process provides control over the raised surface areas. This type of map is not as robust as the Thermoform map, but can be produced with less effort and expense.

(d) *Modified Braille Embossers* can also be used to produce tactile paper maps.

(e) *Ink-jet Tactile Maps* are made by layering a specially designed ink. Each layer is cured by UV irradiation before the next layer is added. This technology is an offshoot of other industries, such as circuit board manufacturing and biomedical applications.

(j) *The substrate for Tactile Map* is a very important attribute, since different materials can enhance or reduce legibility and durability. Several types of substrates can be used to produce a tactile map.

These include rough or smooth plastic, rough or smooth paper or micro capsule paper, Brailing, or aluminium etc. Many factors should be considered when choosing a substrate; these are included according to their respective function, durability, and portability.

(g) *Typical Tactile Elevations:* Thermoformed maps usually have an elevation of at least I mm. Swell Paper averages 0.5 mm and Braille embossers have a range from 0.25-1 mm. Ink-jet printers can be controlled to vary elevation as needed. [A study conducted by Sandra Jehoel (2009) tested various height levels and estimated that preferred tactile elevations fall between 40 and 80 micrometres depending on the substrate background, shape of the object and smoothness of

lines. Symbols such as a triangle, square and a circle should have a minimum base line length of 6.4, 5.0 and 5.5 mm respectively for proper recognition.]

(h) *Audio-tactile Maps or Graphic* Tablets are interactive devices. Electronic tactile talking touch pad instruments use Macro'media Flash software with audio files to convey information to the blind or visually impaired user. As the user's finger engages a feature or symbol a recording provides information about the object, symbol or area. For example the sound of splashing water can be used for areas such as rivers or oceans. This format has great potential for transmitting information over the Internet which can be downloaded to a computer or hand-held device.

[A great deal of hardware already exists that can also be used by the VI students, if available, to interact with computer screen graphics. A vibrating mouse or other force feedback device can be adapted to turn any visual software generated map into a hybrid tactile map. The interactive signal to a device can be varied when crossing a boundary or symbol. High resolution refreshable Braille displays containing 1,500 to 12,000 pixels are already available in market. Graphic Braille display available in the market is DV -2 (from KGS) with 1,536 pixels, Hyperbraille with 7,200 pixels and TACTISPLAY Table/Walk (from Tactisplay Corp.) with 2,400112,000 pixels respectively. TACTISPLA Y table has total 12,000 pixels arranged in 120x 100.]

(i) *Zoom maps* are a recently developed concept of tactile map. These maps are designed specifically for those who can read Braille and have had no previous interaction with tactile maps. The term zoom is comparable to a zoom-able visual raster internet map. A country is divided into regions on the first map then the next zoomed map will have a breakdown of the regions and so forth until a city level is reached. These successive maps rely on a dependable texture as the map zoom progresses. This produces a familiarity as one zooms from the proceeding map. This is achieved in many instances with line orientation, area and consistent shape. The Braille text on the map is placed next to a rectangular textured legend for area identification.

**(iv) Tactile Diagrams**

Pickles (1966) has advocated both the value and viability of drawing for the VI, even for totally and congenitally blind pupils. At the higher stage of school level, he claimed that after such a child has learnt to recognize objects by exploring their shapes and

dimensions through touch he/she should be given the means of making his own diagrams. Since this process is time consuming and offers difficulties in execution, its value can be questioned, but Pickles believes that it is an activity helpful both to those relying on touch alone, as well as for those using touch and slight vision in their understanding of embossed diagrams. The ability to use touch in this way is a skill which cuts across the curricula areas of the secondary school. The child with too little vision for making use of illustrations and visually presented diagrams is specially in need of training in understanding diagrammatic work in embossed relationships and connections, such as in the layout of a piece of laboratory apparatus.

Furthermore, in justifying his emphasis on undertaking surface representation for diagrammatic work, Pickles claims that executing diagrams can be one way of learning to understand their implications. With a rubber mat providing a resilient base, a sheet of aluminium foil can be sued to take a negative (downward indented) line made by a ball point pen. The Sewell apparatus (RNIB) embodies a thin film of transparent plastic sheeting stretched over a rubber-surfaced board, and again, a special ball- point pen, an ordinary biro, or a spur wheel which cuts small dot-like indentations can be used for lines. Manilla paper used for Braille writing can take imprints from a spur wheel and the specialized geometry set available for the RNIB enabled user to make raised geometric figures on paper. Vincent (1970) has constructed a special drawing board which enables the student to prepare perspective drawing, but it is important that the pupil's understanding of what he/she is attempting to do is not superseded by devices that help him to produce work only understandable in sighted terms.

Enthusiasm to make the map or diagram as informative as possible can lead to overcrowding of symbols, whilst the addition of Braille words in the body of the diagram causes confusion. A tactile diagram needs to have enough information to encourage exploration and interest but not so many raised lines, Braille labels, and varied textures that clarity is lost. A series of maps or diagrams, each displaying a particular aspect of what is to be presented, provides a more comprehensible illustration. For example, several basic raised outline maps of a country can be made with additions on one version to indicate climate, on another indications of vegetation, on another population or geological features etc. To crowd all this information on to one map by using different raised symbols likely to be confusing. The information received from such presentations needs to be discussed so that misapprehensions can be cleared up, and the pupil will also need training in interpreting the symbols used. Teachers will need to draw attention

verbally to the information represented and even to ensure that the map or diagram is being used the right way.

### 4.3.2 Presentation of Adapted Tactile Maps, Diagrams and Globe

Children who are visually impaired can do virtually all the activities and tasks that sighted children taken for granted, but they often need to learn to do them in a different way or using different tools or materials. For instance, child may need reading materials in Braille rather than in print or may need to examine a live rabbit with his/her hands to understand what it is, rather than learning from a picture in a book. Other examples might be arranging a classroom to let the child sit close to the science teacher who is demonstrating an experiment or allowing him/her extra time to complete a test that the whole class is taking.

Depending on the child's abilities and needs, he/she may need some adaptations to participate in the curriculum and various activities in school, as well as to make use of instructional materials. The child learns about such adaptations from his/her special/ inclusive teacher or orientation and mobility (O&M) instructor.

Such adaptations in school are usually referred to by the terms 'accommodation' and 'modifications'. Different school systems attach different meanings to these terms, but 'accommodation' usually refers to a change in the way the child is taught or tested without changing the standard of learning or performance or the requirements that she needs to meet. Some examples include having extra time to complete assignments, using Braille or large-print materials, using different types of models, having assignments or tests broken into smaller parts, or completing assignments in a quiet setting away from other students. 'Modification' commonly refers to a change to what your child is learning or tested on that changes the standards or requirements she needs to meet. Being taught material at a lower gradelevel or having to complete fewer items on a test is examples of modifications, because these terms are not used in the same way in all schools.

The VI students often cannot perceive information directly from their environment, but 'accommodations and modifications' help them do so. Something as simple as the 'flexibility' to sit closer to the chalkboard may meet your child's needs, or it could be necessary to alter the physical arrangement of the environment by providing additional furniture, shelving, or access to electrical outlets for the operation of specialized equipment.

Instructional materials need to be put into an accessible format for VI. It is important that all materials be considered-not just textbooks but also worksheets and all supplemental reading materials. It is also important to receive the VI child equally as his/her sighted classmates who read in print.

***(i) Materials***

| **Materials** | **Explanation and Examples** |
|---|---|
| Braille | Textbooks, Worksheets, all materials used in instruction provided in Braille; |
| Tactile Graphics | Printed Maps, Diagrams, Illustrations provided in tactile format; |
| Audiotape Materials | Books and other printed materials provided in audio-tape; |
| Electronic Access | Materials provided in an electronic format for acess with a computer or electronic note-maker, for example, using an online encyclopaedia for studying for completing a term paper or reading a textbook in digital format; |
| Print Book for parents | If your child reads in Braille, he/she also receives a print copy of that textbook parental use; |
| Highlighting | Markers and highlighting tape are used to enhance the important parts of a text; |
| Large-print | Large-print books are used for instruction or portions of a book, such as a map, enlarged as needed; |
| Manipulative | Physical items (such as small toys, buttons, or beads) are used to demonstrate mathematical concepts or used in art classes to complete a tactile drawing. |

**(ii) Tactile and Kinaesthetic Input**

Students with visual impairments use tactile and kinaesthetic input to learn about their environments. Such input should not be thought of as 'lesser senses' to use in the absence of vision, but as another system through which learning takes place (Klatzy & Lederman, 1988). Tactile and kinaesthetic input can provide students with information about objects they come in contact with and use. Any visual materials used in classrooms need to be adapted for use by students who do not have the visual skills required for the task.

Charts, models, maps, and graphs will have greater educational value for students with VI, if they can 'read' using the sense of touch. For example, outlining map boundaries with string enables students with VI to use their sense of touch to read maps. Whenever teachers use manipulative models, or other equipment, students with visual impairments need the opportunity to use their tactile and kinaesthetic senses to become familiar with the objects to benefit from their use in lessons. Teachers should introduce students with VI to materials and equipments used in activities such as science experiments before the activity. If students have the opportunity to learn about the materials or equipments before the activity begins, they will be more able to concentrate on the concept being taught rather than on what equipment they are using. Toward this end, a specialist will assist students and teachers in inclusive classrooms with adaptations as needed.

**(iii) Auditory Learning and Accommodations**

Auditory input provides another way of gaining information by the VI students. Teachers should not assume, however, that students will understand verbal input in the same way and at the same depth as other normal students understand visual input. Auditory language triggers the creation of mental images that correspond with words. Images are recalled to assist students in comprehending verbal language (Barraga & Erin, 1992). A student with VI is likely to have fewer and less detailed mental images to correspond with verbal language. Such images may differ according to a student's individual experiences and verbal input he/she has received from others (Whitmore & Maker, 1985). General teachers should observe and interact with students with VI in an effort to determine whether individual students can understand the verbal inputs. The teacher must check for comprehension during class discussions and when giving directions. If VI students are having difficulty in understanding what the teacher says, the teacher may need to clarify or expand on their background knowledge or vocabulary. Organizations providing services for people with VI offer audio-taped textbooks. Classmates can be designated as note-takers for students with VI. Class notes can then be audio-taped or transcribed using an enlarged font or Braille. General teachers may also develop verbal or other auditory cues as signals for attending important information or particular events. Teaching 'listening skill' is also very important. Efficient listening is crucial to classroom success for students with visual impairments. Improved listening skills help students with visual impairments increase their spoken and written communication and reading skills (Heward, 2000). Teachers can consult vision specialists to determine appropriate auditory accommodations for each student.

**(iv) Visual Learning and Accommodations**

Most students with VI have some usable vision. Their visual learning can become more efficient if they can enhance their skill to use their vision through training or the use ofassistive devices. Observe students to determine that they have visual skills sufficient for locating and tracking visual materials. Vision specialists can offer assistance in developing students' visual skills and in making accommodations necessary for helping students use their vision in productive ways. Such services include making maps, adapting reading materials, and assisting in general accommodations. Many options are available for teachers selecting reading and writing materials for students with VI. According to their needs and preferences, students may use printed or Braille materials. Printed materials should be clear and be printed using an easily readable font. Providing an easel to hold reading materials can help students with VI do close work more easily (Barraga & Erin, 1992). Black felt-tip pens and soft lead pencils are useful writing utensils for students with VI because of the increased amount of contrast they create against white writing paper (Koenig, 1996). An extra light source at the student's work area can also be helpful for some students (Heward, 2000). If a VI student is benefitted from an additional light, the light's placement should be determined in collaboration with the vision specialist. Some simple strategies for using printed materials can help students with VI learn visually without requiring huge adjustments to the classroom environment. Simply holding books or other materials closer is enough to help some students with visual impairments (Heward, 2000). Using magnification devices or large-print materials are two accommodations that are often implemented in the classroom (Barraga & Erin, 1992). Such equipments and materials should be available for VI students who need them. There are some other considerations for general teachers to remember during lessons and when preparing materials for use in the classroom:

a. The student's position in the classroom in relation to visual presentations should allow for an unobstructed view! If necessary, allow the student to move to a position with a better vantage point when visual materials are being used.

b. Information written on the chalkboard should be large. Dry erase boards are good alternatives to regular chalkboards. The bright background strongly contrasts with the colours (especially black) are used for them.

c. All visual aids should have clear, sharp images. Materials with high contrast are easier for students with VI. For example, handouts should have very dark black or navy blue print on bright white paper.

## 4.4 Procuring, Adapting and Use of different types of Models

Each student who is VI or blind has their own unique learning needs. The type of service should reflect a student's need for specialized instruction at a specific time in his/her development process. This may change as the special need student progresses through his/her education. Some students may require a residential or special school specifically designed for students who are blind. The majority of students with VI can be best served within their local school system. Depending on the students needs, they may need a consultation model, an itinerant model or to receive more intensive services in a resource room at a magnet school for students with VI. In order to help students reach their fullest potential, schools should provide a full array of options to assure appropriate placement of each student.

### 4.4.1 Need Assessment and Placement of VI Students

The assessment of VI students has a very crucial role in identifying appropriate level of severity and to place them for educational support system scientifically. Widely used two techniques of need assessment techniques are given below:

i) *The VISSIT:* The Visual Impairment Scale of Service Intensity of Texas (VISSIT) is designed to guide teachers of students with VI in determining the type and amount of itinerant services to recommend for students on their caseload. The individualized education programme (IEP) experts will take decision on the basis of the result of the Scale. This Scale supports the teachers in quantifying information for the IEP of the VI students. The goal of VISSIT is to provide guidance so that all students with VI get the benefit of an appropriate amount and type of service.

(ii) *The VSRS:* The Vision Severity Rating Scale (VSRS) was developed by the Michigan Department of Education through a task force of the State of M ich igan, USA. The scale is very useful for determining amount of services a VI student neecVdue to his!her additional impairments. This assessment should be done once in every three years since needs and levels of support changes over time to determine' the appropriate amount of service a VI student requires at a particular phase of hjs!her developmental process. It has also been further developed to assess the Orientation and Mobility Severity Rating for students with additional disabilities.

### 4.4.2 Models for VI Learners

Three such models are discussed below:

**(i) The Consultation Model**

The students who receive consultation require minimal or no direct services from a teacher of students with visual impairment (TVI). In this model, the service is provided to the adults who work with the students on behalf of the student with VI. It provides itinerant observations of the student within their educational environment to determine if they are receiving the most appropriate adaptations to their materials, environment and instruction and to collaborate with teachers and therapists. Possible scenarios where the consultation model is appropriate include:

- A student with a progressive vision loss whose visual function is still within the normal range may not need direct services. They may, instead, need to consult with the teachers and family about potential changes in the student's vision and ways to prepare the student for future.
- A student who is making adequate academic progress, is not lacking any disability - specific skills, and has appropriate natural supports that facilitate the ongoing development of skills related to functioning in all areas. The student may only need accommodations for testing, or the student's general education teachers and parents may benefit from 'consultation with the TVI
- A student whose multiple disabilities include VI may get frequently benefit best when the special education teacher embeds vision specific skills, activities and strategies into the routine and daily plan. The student in this model may require extensive consultation for team members planning, explaining the unique learning needs of the student.

When providing consultation, the TVI should:

a. Observe the student in a variety of contexts,

c. Provide suggestions on material, environmental and curricular applications,

d. Have frequent contact with the teacher(s), paraprofessionals, and therapists to support their goals! objectives and help them understand the student's visual needs.

**(ii) The itinerant Model:**

Students in the general education programme or those assigned to a self-contained classroom for multiple disabilities may require Itinerant direct services from a teacher

of the VI. The time that the Itinerant TVI spends with the student should be based only on the time required to meet the special education goals identified in the IEP and may vary from daily instruction to biweekly or weekly instruction. While some skills are best address in the general education classroom, others require privacy or a quiet environment.

The teaching techniques to enhance vision should not be taught in isolation. It is important to look at what the needs and activities of the student are in the school and in their everyday life that are affected by their visual performance, and teach to those tasks. The TVI will make suggestions for appropriate environmental and mental adaptations.

**(c) The Resource Room model**

The Resource Room Model is designed for students who require daily support from a TVl. In this model, students attend' a school that has been designated as 'magnet' school for students of their similarly aged with VI, who need daily contact with TVI. A TVI is based at the Magnet School in order to be accessible to the students and their teachers throughout the school day. Students are assigned to a general or special education classroom for most of the school day.

Students attending Magnet Resource Classrooms have intensive instructional needs related to their visual impairments. The amount of time spent in the VI classroom will vary among students, based on their unique needs. They will typically spend part of each day receiving instruction in the areas of the core curriculum and support that facilitates their academic progress. Although the TVI is not an academic tutor, the TVI may spend time ensuring that students understand concept introduced in the academic courses. Some students will receive instruction in ways to access academic subjects, such as reading or basic mathematics, to build a strong foundation upon which future learning can occur.

*Advantage:* the TVI has more opportunities in this model to observe students in a variety of situations, including classrooms, bus lines, the tea-stall, the playground etc. providing them with more opportunities to assess the student's skills and areas of needed instruction throughout the day. Since they are available to students and general education teachers throughout the school day, they can provide immediate assistance to teachers who are uncertain how to include students with VI in the curriculum by helping these teachers adapt materials or modify instruction or by teaching classroom activities that cannot be easily adapted in other ways. Students in a VI Magnet School have more opportunities

to meet and frequently interact with other students who have visual impairments. Through planned and unplanned activities, they can discover issues they may have in common and solutions to problem related to their visual impairments. This model allows older and more fluent Braille readers the opportunities to mentor younger students.

Disadvantages: vantage of the VI Magnet School Model is that students may not attend their home schools and therefore may not attend school with their siblings and other children in their neighbourhoods. Because of the geographic distances between their homes and the school, students may find it impossible to attend planned or impromptu after-school or evening activities, and parents may be challenged to feel part of the school commun ity and to participate in parent-teacher activities or school advisory committees.

## 4.5 Organizing Field Trips

Children learn what others expect of them and thus develop their own expectations for themselves through daily experiences with their communities. Visually impaired pre-schoolers need enhanced, planned opportunities to learn about their communities through firsthand experiences.

Community field trips can be important and help career development opportunities. They give pre-schoolers the chance to learn about what workers do in fire stations, physician offices, bakeries, post offices, or restaurants.' Here are 5 tips for making the trip a positive learning experience from the book *"Skills for Success: A Career Education Handbook for Children and Adolescents with Visual Impairments "*]:

1. Hands-on learning opportunities are essential for children with visual impairments. Let the contact person at the community site know that children will need to touch equipment and explore the environment. Make arrangements for them to handle and explore selected items at the site.
2. Prepare children for the trip by discussing where they will be going. Ask, "What do you think will be there?"; "Who will be there?"; and "What will we see?"
3. Provide verbal labels and descriptions of the objects as the children examine them, for instance, "The fire truck is a big red truck" and "The fire-fighter wears a hard hat and black rubber boots."
4. Use field trips to help children integrate concepts being introduced in other

activities. A trip to the petting zoo to learn about zookeepers or to the humane society to learn about veterinarians is a natural component of a unit on pets and the classification of animals.

5. Provide opportunities for children to meet adults with similar disabilities to theirs and to notice these people doing work or carrying out activities. Emphasize similarities in their adaptive tools and the adults' tools-for example, "Mrs. Daugherty's hearing aid is the same as yours."

With field trips one can provide a broad range of experiential learning opportunities that are developmentally appropriate, from unusual places such as a pottery studio to traditional community sites such as a police station or farm. Every experience helps a child think more about "what do I want to be when I grow up?"

Science educators today face the challenge of improving thinking skill, interest and success in science learning. They typically do this through the science curriculum which is taught in the formal classroom setting.

## 4.6 Teaching Skills: Role Play & Dramatization, Narration & Explanation, and Story-telling

Schellin (2006) claims that simulation, role play and drama are three very useful learning techniques. According to him, simulation is longer than role play, and students keep their own identities instead of playing a role. In role play, on the other hand, students assume a role and play a part in a specific situation.

### 4.6.1 Role Play and Dramatization

In drama, students are supposed to act out exactly what is written III a script. Schell in (2006) illustrates how the three tools can be combined, and demonstrates a model for a teaching method in which students practise simulation, role play, and drama in combination. Role plays a teaching method has many points in common with dramatization. He indicates, therefore, that it is preferable if teachers use the two synthetically. Even though there are some differences in length, creativity, and flexibility, all of these techniques can serve beneficially for learners as a rehearsal for real life, and inspire learners to acquire the target language in a comprehensive manner.

The difference can be the length of the play, as well as the time needed to prepare, but they have many characteristics in common at the fundamental level; role play and

dramatization can be practised with almost the same procedure and they have similar effects on developing language skills. A very simple role play of a prepared dialogue and a creative drama might not be aimed to the same level of learners.

Accordingly, we use the term 'role play' for a short sketch based on prepared scripts, 'short drama' for a drama which is inventive and contains just one scene, and 'creative drama' for a long, creative, and comprehensive type of drama. We can use the term 'dramatization' as a category which embraces all 'role-play', 'short drama' and 'creative drama'.

The impact of dramatization in foreign language classes is quite remarkable, and students tend to enjoy themselves and learn many things including language skills from this activity, both as an actor and as an audience. The short dramas in classroom activities can be extended to long creative dramas to make it as a teaching method to learn the culture and civilization of the target language in an inclusive way.

Very short drama or role-play activities are suitable even for beginners, if appropriate dialogues as a reference and teacher's help are provided. Moreover, there are definitely advantages for VI learners from the beginning to practise dramas in order to improve their communication skills for the following reasons:

- Right from the beginning the VI students can practife their pronunciation while having fun, as they practise their lines repeatedly.
- The fear of using a new language in front of others is diminished through the repeated performance.
- Repeating and using the target language from the beginner's level, the VI student will naturally acquire a living language, grasping and experiencing the meaning of the target language's world-view.

The activity of dramatization is just a possible way to gain a sustainable, long-term effect in acquiring language. Kawakami may be right, as he said the effectiveness of dramatization activity is not something we can perceive immediately. Nevertheless, the language itself has a characteristic that we learn in the long term, while accumulating experiences of communication in many situations. Thus the successive activities of dramas must serve as a repertory of simulation of exemplified situations.

**(i) Procedure**

The whole class is first instructed about the activity of role-play and dramatization and its procedures. Then the students form pairs. Each pair get the worksheet with the

situations and is asked to choose one situation about which they will write a script for a short drama. They are supposed to think about the characterization of the drama characters and write a script cooperatively. The students are allowed to use freely consult dictionaries, reference or the textbook, and can ask questions to the teacher. The teacher shall collect all the audio or written scripts and gove them back to the students with some grammatical corrections and some suggestions for expressions in the following week. Then the VI students will practise the modified script for about ten minutes. Finally, each pair will play the short drama. While a pair is acting out their original drama, other students carefully watch/ observe/ listen their plays. They are applauded at the end of each short drama. Therefore, the class has a spirited and friendly atmosphere, and students seem to quite enjoy writing a script inventively instead of just memorizing the dialogues in the textbook.

**(ii) Advantage**

Role play and dramatization can be classified as communicative methods of foreign language learning. In this section, we point out the problem of the tenet of the communicative approach that a top priority should be given to create meaning and that grammatical correctness is considered less important. In everyday conversation, it might be possible that we put a greater emphasis on conveying meaning than speaking correctly. Nevertheless, in classroom instruction, correctness of forms should be also respected, as long as it is a part of the education program. This article claims that the activity of the dramatization is one of the best and most appropriate methods for improving one's communicative skills as well as paying attention to the grammatical accuracy suggested by one's teacher. As the result of Question 2 demonstrates, error correction would not work as a deterrent for their creating drama in a short drama activity. Students memorize the modified scripts for performing a play, and as a result, they can acquire grammatical accuracy, while performing a role in a communicative way.

**(ii) Difficulties**

Sano (1989) points out one of major difficulties with conducting the activity of drama in a class that psychological pressure is a burden for students who are introvert in nature. Moreover, some VI students may feel nervous when making an oral presentation in front of an audience, even though they are not introvert or shy. The picture-story shows and puppet plays may be the solutions for these problems. However, they would not be fundamental solutions if students feel uncomfortable in the first place to speak in front of many people. Furthermore, one of the advantages of drama activities, reciting with natural gesture and facial expressions, would be ignored in picture-story shows and

puppet plays. Habituation to oral presentation in front of the class would be the best method to handle the anxiety of speaking in public by the VI students. This kind of accustomation permits students to fight against the fear of oral presentation and may serve them in their future experiences as well as in their drama activities in the class. Although several studies have been done to demonstrate the effectiveness of dramatization, few have been done for the VI students.

### 4.6.2 Narration and Story-telling

Oller (1981) mentions the importance of meaningful communicative settings especially for the VI students. It is clear that the analysis of episodes and linking them up with semantic categories can constitute a central process in learning. Richard-Amato (1988) also indicates that presentation of episodically organized materials can indeed be an effective language teaching approach. Through materials that do not violate the logic of normal discourse, the student can receive optimal input which can enhance the ability to reproduce, understand, and recall the target language. This view of putting language learning into meaningful and comprehensive situations corresponds to the perspective of cognitive linguistics that we experience and cognize the world as a gestalt. It also conforms to one of the major theories in cognitive semantics, frame semantics, which claims that in order to understand the meaning of a word, encyclopedic knowledge concerning the word is indispensable.

People have always told stories; it is the oldest form of remembering. In ancient times, long before written language was developed, people told stories to preserve the history, traditions, desires, and taboos of their social groups. Each generation told their stories to the next, which in turn told the stories to the youth of the generation that followed them.

Since prehistory, all cultures have passed along such tales through the oral tradition, and they have always been an essential part of our humanness. Some stories were told just for entertainment. Others were used to share the history of a group of people and also to teach lessons and transmit values and beliefs. Still others were intended to explain natural phenomena-such as the changing of the seasons and the cycle of night and day-and usually involved the people's gods and other religious beliefs. Certain stories were accompanied by music and were sung instead of recited. These stories remained in a constant process of variation, depending on the memory, talent, or purpose of the storytellers (Anderson, 2005, 81).

Story-telling, the art of narrating a tale from memory rather than reading it is one of the oldest of all art forms, reaching back to prehistoric times. Storytelling involves two elements - selection and delivery. Many English and Foreign Language (EFL) teachers are interested in storytelling as a resource in teaching. A successful story-teller chooses adequate stories and must be a good performer, for the delivery is crucial and requires both preparation and rehearsal. Story-telling is the original form of teaching and has the potential of fostering emotional intelligence and help the child to gain insight into human behavior. Story-telling also promotes language learning by enriching learners' vocabulary and acquiring new language structures. Moreover, storytelling can provide a motivating and low anxiety context for language learning. The story-telling tips given in this article are meant to help the teacher-as-storyteller as he/she prepares for a storytelling 'performance' for students.

Story-telling is the original form of teaching. There are still societies where it is the only form of teaching the beginners with VI, though attempts have been made to update it. A simple narration will always be the cornerstone of the art of teaching. Colloquial or literary, unaffected or flowery - the full range of language is present in stories developed in a unique way. The listeners may also be benefitted from observing non-polished speech created on-the-spot. While listening to stories, children develop a sense of structure that will later help them to understand the more complex stories of literature. In fact, stories are the oldest form of literature.

Through traditional tales, people express their values, fears, hopes, and dreams. Oral stories are a direct expression of a literary and cultural heritage; and through them that heritage is appreciated, understood, and kept alive. Through a story, listeners experience a vicarious feeling for the past and a oneness with various cultures of the present as they gain insight into the motives and patterns of human behaviour.

However, many storytellers feel that cognitive enrichment is not the primary aim of their art. Stories have numerous affective benefits for social and emotional development. A story session is a time to share feelings. A relaxed, happy relationship between storyteller and listener is established, drawing them together and building mutual confidence. Stories help children to know themselves and to know others so they can cope with the psychological problems of growing up.

Story-telling is also a living art. Like music and dance, it is brought to life in performance. A story will be altered by the storyteller's background: his/her choice of setting and detail, and the rapport established with the audience. The storyteller's building materials are words, sounds, and language patterns. The tools are the voice, face, and hands. The

product is the creation of a shared human experience based on words and imagination. Storytelling is an individual art, and an imposed method or ready-to-use plan will prove inadequate. Beginning storytellers must go beyond the rules. They must know their personal strengths and develop their own unique style.

**(i) Advantages:**

The most important advantages of storytelling may be summarized as follows:

- Stories are motivating and fun and can help develop positive attitudes towards the foreign language and language learning. They can create a desire to continuum of language learning for VI students..
- Stories exercise the imagination. Children can become personally involved in a story as they identify with the characters and try to interpret the narrative illustrations. This imaginative experience may develop VI learners' own creative powers.
- Listening to stories in class is a shared social experience. Reading and writing are often individual activities; storytelling provokes a shared response of laughter, sadness, excitement and anticipation which is not only enjoyable but can help build up VI child's confidence and encourage social and emotional development.
- Children with VI can enjoy listening to stories over and over again. This frequent repetition allows certain language items to be acquainted with while others are being overly reinforced. Many stories also contain natural repetition of key vocabulary and structures. This help children to remember every detail, so they can gradually learn to anticipate what is about to happen next in the story. Repetition also encourages participation in the narrative.
- Listening to stories allows the teacher to introduce or revise new vocabulary and sentence structures by exposing the VI children to language in varied, memorable and familiar contexts, which will enrich their thinking and gradually enter their own speech.

There are three main dimensions in which stories can add to learning in the whole school curriculum:

1. Stories can be used to reinforce conceptual development in children (for example, color, size, shape, time, cause and effect, and so on).
2. Stories are means of developing learning. This major category covers - (a)

Reinforcing thinking strategies (for example, comparing, classifying, predicting, problem-solving, hypothesizing, planning, and so on). (b) Developing strategies for learning English (for example, guessing the meaning of new words, training the memory, self-testing, and so on). (c) - Developing study skills (for example, making, understanding and interpreting charts and graphs, making and learning to use dictionaries, organizing work, and so on).

3. Carefully selected stories can also be used to develop other subjects in the Curriculum, III particular:- Geography and the Environment in the local area, neighborhood parks, sports and games, using a map, using the atlas, the weather and climates around the world, cultural studies etc.

**(ii) Story Selection**

Selection requires an ability to evaluate stories and to discriminate between those that meet your learners' needs and those that do not. Although learning stories directly from other story-tellers is the traditional method, one learns most stories from books. Many publishers produce simplified storybooks especially for children learning English. However, there are many authentic storybooks written for English-speaking children which are also suitable for those learning English. As they have not been written specifically for the teaching of English as a foreign language, the language is not selected or graded. Many, however, contain language traditionally found in most beginner syllabuses. The advantage of using authentic storybooks is that they provide examples of 'real' language and help to bring the real world into the classroom. Very often simplified stories represent a watered-down version of the English language and can deceive both teacher and learners about the true nature of language. Authentic can also be very motivating for a child as they experience a strong sense of achievement at having worked with a "real" book. Furthermore, the quality of illustration is of a high standard, appealing to the young learner, and it plays an important role in aiding general comprehension. Wide reading gives authority to your telling. Teachers can choose from a wide range of storybooks: those that children are already familiar with in their mother tongue, such as traditional stories and fairy-tales; picture stories with non text, where the children build up the story together; rhyming stories; cumulative stories with predictable endings; humorous stories; stories with infectious rhythms; everyday stories; fantasy stories, animal stories, and so on.

*How Children Benefit from Listening to Stories?*

**Hearing stories:**

1. Stimulates the imagination.
2. Improves listening skills.
3. Instills a love of language, reading, and creative writing.
4. Improves language skills, such as vocabulary, comprehension, sequencing, and story recall.
5. Builds community by providing a common experience and collective language of story catch words and phrases.

*How Children Benefit from Telling Stories?*

**Story-telling:**

2. Increases self-esteem by building confidence in speaking before groups.
3. Improves expressive language skills and stimulates inventive thinking.
3. Promotes greater cooperation and stronger relationships among children and between students and teachers. If we know others' stories, we are less likely to judge or misunderstand them.
4. Encourages personal growth through risk-taking.

### 4.6.3 Explanation

Explanations are integral to the learning process and can be used as an effective elementary social science teaching strategy when combined with opportunities for student activity. Effective explanations may involve the following:

- The use of clear language.
- Good teacher delivers the subject knowledge in simplified chunks,
- An awareness of what the students already know,
- The use of memorable examples.
- Ongoing questioning to check the level of understanding,
- Actively engaging all the students of a class.

Pupils process information in different ways. Visual learners have a preference for reading words and looking at diagrams and images; auditory learners have a preference for

listening: tactile or kinaesthetic learners have a preference for touch and movement. Small modifications to the explanations can address each of these learning styles, thereby improving the educational experience more effectively to all the students.

**What makes an explanation effective?**

The teachers will be required to provide scientific explanations that engage all the students in a classroom irrespective of their special needs. Some of the following activities may encourage the students to start thinking about the respective learning process.

**Activity for giving a clear explanation:**

1. What is the core information that the students need to know about a given topic?
2. What do the students already know?
3. What scientific vocabulary needs to be used? Does this need to be explained too?
4. How will the explanations be made engaging and memorable to the students?
5. What questions will be asked to check the students' understanding?

## 4.7 Evaluation of Concepts and Skills in Social Science with reference to Geography

### 4.7.1 Geography skills

Students' Geographic skills under several categories need to be evaluated after the learning process being completed. Just like the normal students, VI learners also be evaluated using the slightly modified techniques. The basic Geographic skills are:

**(i) Geographic resource interpretation skills**

These include using maps, photographs. diagrams. cartoons. Images. statistics. keys, graphs. text, models. internet. speeches. surveys, films.T'V. video clips and GIS to explain geographic information.

a. Geographic resource construction skills include presenting spatial data which may include, but is not limited to, drawing sketch and precise maps. using GIS layering and/or other multi-media to present specific geographic information.

b. Presenting statistical data may include, but is not limited to. constructing graphs. tables, performing calculations based on data.

c. Presenting visual data that may include, but IS not limited to. taking photographs or drawing pictures, cartoons. multi-media.

d. Complex presentations like multiple forms of data for example Visual, spatial and statistical combined.

**(ii) Communication skills**

It includes that being able to present geographic information in a variety of forms such as essays, paragraphs. poems. visuals. models, films. Powerpoint presentations, speeches. games, puzzles. blogs and graphic organisers.

**(iii) Social skills**

These include that being able to work in groups and being empathetic. appreciating different values, perspectives and viewpoints on different aspects of geography, establishing and justifying personal value positions, contributing and participating in the community.

**(iv) Fieldwork skills**

These include being able to gather information from the field using a variety of techniques Such as surveying. questionnaires. field sketching, measuring. photographing, interviewing and observing.

**(iv) Resources for Skill Evaluation**

In the examination a resource booklet is provided which is used to assess the students' understanding of the concepts and application of geographic skills. This may include a variety of resources such as maps, tables. diagrams, photographs, opinions. These will generally be about a particular geographic issue in a setting which could be from India or overseas.

The resources provided at level I are more straight forward than those at levels 2 and 3. For example a topographic map at level I will be relatively easy to interpret. At level 3 topographic maps will be in their original state and be more complex. ro interpret. Complex satellite imagery will only be used at higher levels.

**a. Mapping**

Distance, use of six figure grid references, use of latitude and longitude. compass direction. bearings, scale. area calculation. location of natural and cultural features. determination of height, cross sections. use of a key, precis map construction. recognition

of relationships, application of concepts, interpretation of other geographic maps like weather maps, cartograms. choropleth maps.

**b. Visuals**

Interpretation of photographs, cartoons or diagrams including pyramids and models such as a wind rose: interpreting and completing a continuum to show value positions.

**c. Graphing**

Interpretation and construction of bar graphs (single and multiple). line graphs (single and multiple), pie and percentage bar graphs, scatter graphs, dot distribution, picrograms. and climate graphs.

**d. Tables**

Recognition of patterns, simple calculation such as mean. mode. and conversion to percentages. At level III. the intention is for students to select and apply skills. This means that while the same skills are assessed as at level IL students need to be able to select appropriate skills to answer questions. For example, students may be asked to give the location of a feature which requires them to use a combination of skills such as grid references, latitude and longitude, or direction and distance from another feature. They may be asked to describe the physical geography of a region which would draw on skills such as interpreting contour lines. cross sections. climate graphs and wind roses.

**e. The complexity of the examination questions**

Questions at level I are related to the use of a specific resource only. At level II, one or two resources may have to be used to answer questions. At level 3 several resources from throughout the resource booklet may be used to apply a skill. Instruction words will also differentiate the levels where longer written explanations arc required. At level 1 most of the questions will be based around describe or describe and explain. At levels 1I and III, terms such as justify and evaluate may be used.

**f. Guidance given to students in the examination**

Candidates are given more direction at level 1 with less guidance at level III. For example, at level 1 a candidate will be told which type of graph to construct and be provided with

axes or asked to complete a graph that has been partially done, for example, complete the rainfall for a climate graph where the temperature is given.

At level II. candidates witl/be told the type of graph to construct within a given space, whilst at level 3 candidates will have to select which is the appropriate graph to construct using more complex resources.

At level III candidates will have to locate major features on a precis map: at level 2 to locate features where some outline is provided; and by level 3 only a minimal outline is provided for guidance.

### 4.7.2 Assessing geographic concepts

Conceptual understandings underpin the knowledge and skills assessed by the achievement standards (NCEA level I to III) and scholarship performance standards. Students are required to understand how these concepts can be applied to new settings, as well as applying them to the contexts they have studied specifically.

Differentiation of concepts applies across the levels. A student's understanding of a concept at level I will be at a more basic level than an understanding at levels II or III.

As students build geographical knowledge and skills, they will approach these concepts in different ways. By revisiting them in different contexts, they will come to refine and embed understandings.

**(i) The key concepts or big ideas in geography**

Geographic concepts allow for the exploration of relationships and connections between people and both natural and cultural environments. They have a spatial component. They provide a framework that geographers use to interpret and represent information about the world. The development of understanding of these concepts will allow VI students to participate as critical, active. informed and responsible citizens.

The geography achievement objectives are based on conceptual understandings. A concept is a general idea, thought, or understanding. Conceptual understandings are what learners know and understand about a concept. When the concepts are elaborated

into generalisations, they become conceptual understandings. The key concepts are all derived directly from the Level VI to VIII achievement objectives for geography.

**a. Local Environment**

It is expected that VI students will develop their understanding of concepts through time. Teachers may also choose additional concepts that may connect with the local environment or the circumstances of their students. Such concepts must be geographic in nature: they must have a spatial component.

b. *Spatial components* relate to how features are arranged on the Earth's surface. For example, an understanding of 'environments' will be supported by students also developing an understanding of additional concepts such as location. distance and region. Other concepts may apply to specific contexts, for example. rehabilitation and mitigation for extreme natural events or natural increase and dependency ratio for population.

**c. Natural and Cultural Environment**

They have particular characteristics and features which can be the result of natural and/ or cultural processes. The particular characteristics of an environment may be similar to and/or different from another. A cultural environment includes people and/or the built environment.

**d. Perspectives**

Ways of seeing the world that help explain differences ill decisions about, responses to, and interactions with environments. Perspectives are bodies of thought, theories or worldviews that shape people's values and have built up over time, riley involve people'sperceptions (how they view and interpret environments) and viewpoints (what they think) about geographic issues. Perceptions and viewpoints are influenced by people's l'al/les(deeply held beliefs about what is important or desirable ),

**e. Processes**

It is a sequence of actions, natural and/or cultural, that shape and change environments, places and societies. Some examples of geographic processes include erosion, migration, desertification and globalisation.

**f. Patterns**

May be spatial: the arrangement of features on the earth' s surface: or temporal: how characteristics differ over time in recognisable ways,

**g. Interaction**

It involves elements of an environment affecting each other and being linked together. Interaction incorporates movement. flows, connections. links and interrelationships which work together and may be one or two way interactions. Landscapes are the visible outcome of interactions, Interaction can bring about environmental change,

**g. Change**

It involves any alteration to the natural or cultural environment. Change can be spatial and/or temporal. Change is a normal process in both natural and cultural environments, It occurs at varying rates at different times and in different places. Some changes are predictable, recurrent or cyclic, while others are unpredictable or erratic. Change can bring about further changes.

**i. Sustainability**

It involves adopting ways of thinking and behaving that allow individuals. groups. and societies to meet their needs and aspirations without preventing future generations from meeting theirs. Sustainable interaction with the environment may be achieved by preventing. limiting, minimising or correcting environmental damage to water, air and soi I. as well as considering ecosystems and problems related to waste. noise, and visual pollution.

## 4.8 Let us Sum Up

The 'Intervention and Teaching Strategies of Social Science' has been discussed here in the self- instructional mode. The main objectives of this learning material is to focus on - (i) Acquiring necessary techniques of preparation and presentation of adapted tactile TLM for Social Science; (ii) Adaptation of different types of models for teaching Social Science suitable for VI students; (iii) Organization of field trips for VI students; (iv) Acquiring different skills for teaching Social Science suitable for VI students and (v)

Evaluation of concepts and skills in Social Science with Special reference to Geography.

Since the normal educational experiences are not sufficient for the VI learners, some adaptive measures are to be taken for them. In order to make them capable to receive educational inputs appropriately, the adapted alternatives should be developed. The obvious alternatives may be of many types. The special methods, materials and equipment can be employed utilizing the sense organs of touching, hearing, smelling and even tasting. Here, adaptations to the general teaching-learning materials along with use of some specialized models especially designed teaching skills with field trips for learning of the VI learners have been discussed.

## 4.9 Check Your Progress:

1. What do you mean by tactile graphics?
2. Discuss different techniques of preparing tactile maps.
3. What is meant by learning accomodations for VI learners?
4. What is fieldtrip? State its importance in social science teaching.
5. How the Field-trip for V.I. learners can be organised?
6. Why is the dramatization possible way to gain a long-term effect in acquiring language?
7. Differentiate between Role-play and dramatization.
8. State the advantages of story telling technioque for V.I. learners.
9. State the basic geographic skills to be learnt by the V.I. Students.
10. Identify some fundamental concepts of Geography to be learned by the V.I Students.

## 4.10 References

Prasad, J. & Prakash, R. (2007), Education of Hadicapped Children, New Delhi.

Sardegna, J., Shelly, S. & Steidl, S.(2"d edition), The Enclyclopedia of Blindness & Vision Impairment.

Ghosh, S K (2002), Inclusive Education: The Indian Context, Progressive Publishers, Kolkata.

Cox, P. and Dykes, M., Effective Classroom Adaptations for Students with Visual Impairments.

www.en.wikipedia.org/wikiltactile graphic

www.teachinngvisuallyimpaired.com/service-del ivery-models.html

www.pathstoliteracy.org/sites/pathstolit~racy.perkinsdevi

www.fami lyconnect. org/info/ ed ucati on/know- your -rights/accomrnodations-and.m od i f cationsay-a- glance/235

# Unit - 5 ❑ Teaching of Children with Low Vision

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**5.7.1 Environmental Influences**

**5.7.2 Classroom Management**

**5.8 Let us Sum Up**

**5.9 Check Your Progress**

**5.10 References**


## 5.1 Introduction:

Low Vision is significant impairment of vision, but not blindness. It is important to identify children who have impaired Vision. There will be Psychological problems

associated with a diagnosis of low vision. One of the primary problems for low vision child is that there is very little which he can pick up just incidentally through his visual sense. He needs to be taught the process of discrimination between the forms, outlines, pictures and symbols which have never been brought to his/ her attention.

So the purpose of any low vision education programme is to encourage and help each child with low vision make best use of vision. There are three aspects in training effective use of vision such as stimulation of vision, visual efficiency and utilization of vision. Use of vision in children having minimal amount of vision needs stimulation. Encouraging the use of vision is vital for children with low vision as it enhances their development, education and experiences. When an infant has severe visual impairment, to help him to learn to see, stimulation must be simple. The visual efficiency can be developed by training but cannot be measured or predicted clinically with any accuracy by medical, psychological or educational personnel. A variety of activities should be given for vision stimulation and visual efficiency.

## 5.2 Objectives

After studying this unit the learners will be able to :

- Explain the meaning and importance of vision training.
- To carry out the activities for vision stimulation and visual efficiency training.
- Select and use the appropriate learning medium for low vision children.
- Plan programmes for training in reading and writing skills.
- Acquire the techniques of teaching Orientation and Mobility skills.
- Manage Class-room situations for low vision children.
- Provide necessary environmental modification in home and school.

## 5.3 Visual stimulation : Concept and procedure

### 5.3.1: Meaning and Importance of Vision Training

Vision training, also known as vision therapy consists of a variety of programmes to enhance visual performance. It includes treatments for focusing, binocularity and eye movement problems.

Vision therapy can increase reading efficiency because the goal of vision training is to improve visual efficiency and visual processing. Children rubbing their eyes while reading, avoiding reading, or getting headaches while reading should be evaluated. Problems with focusing (accommodative insufficiency) or problems keeping words single (convergence or divergence problems) may be present. A full eye - health evaluation and vision training workup may reveal problem. Vision training is also appropriate for people learning how to coordinate the eyes after surgery for squint. Vision training can also be usd in lazy eye (amblyopia) and includes patching the eye and doing various exercises.

### 5.3.2 : Aims of Vision Training

The aims of vision training include the following : To encourage and help each child with low vision make best use of vision.

- To provide a variety and a number of opportunities for the child to learn about and understand his environment.

**There are three aspects in training for effective use of vision:**

1. **Stimulation of Vision**

Children who have very little vision or have not used vision need to know that they can use their vision. They may also need encouragement to do so.

2. **Visual Efficiency**

How residual vision can be improved through vision training? Measures of vision do not change after training- visual acuity, visual fields will not change because of the training.

3. **Utilization of Vision :**

How to use vision leads to knowing how to change the environment/ lighting choosing suitable materials and using low vision devices if needed.

### 5.3.3 Visual Stimulation: Concept and Procedure

**What is visual Stimulation?**

Encouraging the use of vision is vital for children with low vision as it enhances their development, education, and experiences. Use of vision in children having minimal amount of vision needs stimulation. Visual stimulation is the use of strong visual stimuli

to make an infant or child aware of the vision. These children usually have very limited visual capabilites and no visually guided functions.

Smith and Cote ( 1982) stated that the area of brain, which is responsible for vision, would remain underdeveloped unless stimulation and visual experiences are povided. How efficiently the child functions visually is the direct result of the quality of sequential presentation of visual stimulation experiencs. For visually impaired children, the use of vision is not an automatically learned process.

**Visual Stimulation Serves Multiple Purposes for children**

- **Who have residual vision.**
- **Who have vision but don't use the vision for visually oriented behaviours or for incidental learning.**
- **Who have vision but not learned to interpret what they see.**

The definition of blindness is based on measurements of visual acuity and visual field. These visual functions cannot be measured in young children with the techniques used in the assessment of adult persons. Many children in our country do not receive early intervention because of the present testing system. Visual impairment affects many areas of development. In infancy vision is very important in interaction - visual communication between the child and the parent, motor development, object permanence, spatial concepts etc. In pre school age visual communicationis the dominent way of communication and visual impairment may effect social contacts, orientation& mobility etc. There is need to stimulate the existing vision to use and to develop assessment of functional vision and define related functions at different age levels.

**Activities for Stimulation of Vision**

When an infant has severe visual impairment, to help him to learn, to see, stimulation must be strong and simple.

**Playthings**

Toys are more effective for vision stimulation because they are more interesting and easy to use. Many usual playthings are useful. Contrast can be enhanced by adding colours to the surfaces of the play items.

**Bottle with Stripes**

Bottles with bright stripes on white background attract the infant to look. Sounds with the water in the bottle may give the child the other source of information - auditory, and

may attract the child to look at farther distances. By using different yarns on the surface can give different tactile qualities. Tactile information will be a compensatory source of information. The other source of information can be trained together with the use of vision.

**Shiny Objects**

Shiny surfaces that reflect light are strong stimuli for grasping, Plastic balls covered with shiny papers, shiny rattles etc., which have both visual and auditory stimulation can be used.

**String of Beads**

The string of beads can be kept in a holder. When the string is brought closer to the child's face the child can grasp it easily. The movement of the beads, its soft sound and the various colours of the beads will be an effective activator in early stimulation.

**Illuminated Toys**

Illuminated toys and ball or fluorescent ball that glows in a dimly lit room will activate a visually impaired infant.

**Flickering Lights**

When nothing else seems to work, one may try to use flickering lights at close distance. Because of flicker, the toy can be used by many children with very limited residual vision. The child expresses for the first time the joy of seeing light.

Stimulation during the first month of life and certainly before age six is important for preventing visual deprivation. The presentation of visually interesting stimulus items will motivate a child to become visually attentive. The child might attain visual attention more rapidly provided with an opportunity to experience natural consequences of using vision.

## 5.4 Selection of an appropriate medium of reading and writing

The ability to communicate effectively through speaking, listening, reading and writing to the extent of one's abilities is of fundamental importance in achieving assimilation into society. The most vital component of the total communication process is reading. Reading and writing is of equal importance and value for individuals with visual impairments. An efficient reading medium facilitates education and integration into school, learning and work environments.

### 5.4.1. Choice of Reading Medium

For sighted, print medium is the universal method of expressing language. However, for children with low vision the decision regarding the approprite learning medium is not straightforward or predetermined in any way. Since literacy is measured by the ability to demonstrate effective reading and writing medium, much attention must be devoted to making decisions by which each person with visual impairment will read and write.

### 5.4.2. Visual Process in Print Reading

Reading is not performed through continuous eye movement but through sudden changes of fixation, fixing a given point in a space, encompassing the surrounding letters. The speed limit of the eye to shift from the fixation to another is determined by the time that brain takes to process the information input. Faster reading is not achieved by quicker eye movement but an expansion of visual field. Visual process plays an important part in print reading. Reading speed is a factor specially affected by visual deficits. The reading speed is influenced by factors like visual functioning, cause of low vision and type of optical help etc. For many young people with low vision the inability to read is the most serious consequence of their eye disease because of the input it may have on learning process. Low vision persons have some differential characters that sometimes teachers may not be aware to evaluate. Textual information is processed differently by foveal and peripheral regions of retina.

### 5.4.3. Superior Medium Print or Braille?

There has been ample discussion among the professionals in the field as to the superiority of one medium over another medium for students with low vision. However such discussion does not reflect a full appreciation of the complexities and differential characteristics of children with low vision. There can be no predetermined reading medium for all students within an arbitrary category and still uphold the principles of educating each child to his or her individual capabilities and needs.

The children who show a preference for gathering information visually can develop eficient reading skills through the visual channel, the primary consideration should be given to instruction in reading in print.

For students who do not have sufficient visual functioning to develop efficient reading in print, the consideration can be given to instruction in reading Braille.

Some children may need both print and Braille for their education and life situations.

The value of one medium over other is not a matter. The important factor is the degree of care that is taken in matching the appropriate reading medium with the child's individual sensory and learning capabilities and needs. The task of the teachers is to provide instruction learning medium or mediums which will allow the child to become a literate adult, not to restrict opportunities for achieving literacy by failing to match a child's existing abilities with the apporopriate learning mediums.

### 5.4.4 Principles in Determining the Reading Medium

The determination of the appropriate learning medium is but one of critical decisions. The appropriate learning medium is based on a set of fundamental principles that reflect the individuality and unique learning characteristics of each low vision child.

**These are:**

- Individual needs and abilities.
- The teachers should know the child's unique abilities and needs.
- Students with low vision possess a wide range of learning characteristics that are unique in themselves (e.g. reading with central vision, reading with peripheral vision etc.).So no global statement can be made for the total population. It should be based on the individual learning characters.
- The students who show a preference for gathering information visually can develop reading skills in print.
- The students who do not have sufficient visual functioning can be given instruction in Braille.
- Instruction in both print and Braille may be appropriate for some students as he may need very large print for some educational purposes and majority of his educational aspect he may be using Braille. Some children may use print in day time for short duration and Braille for night time.
- Some students may read print but cannot write print. They can be allowed to use both methods.
- The decision should be based on the stuednt's unique sensory capabilities - ability to receive information through sensory channels, stability and prognosis of the

eye condition. The decision should not be on arbitrary criteria such as visual acuity or legal blindness.

- Each students with low vision should be assured that decisions regarding the learning medium are based on the sensory/overall visual functioning.
- The teacher who determines the medium should have professional training and professional judgement.

The professional involved in the education of the children with low vision should realize that the children should learn to communicate effectively. The teachers and educational team should have professional judgement in matching the appropriate learning medium with the child's individual sensory and learning capabilities.

## 5.5 Techniques and Procedures for developing reading and writing skills

The children with visual problems can be identified with some simple techniques. Visionmay be improved with spectacles, treatment and operation. Children and youth with low vision have unique educational needs. The functional vision assessment should state the child's primary mode of reading, whether it is regular print, large print or braille.

### 5.5.1 Programme for developing reading and writing skills

**Visual Reading/ Writing**

In low vision services, print reading is the specific goal of the low vision persons. Near acuity is measured in the functional assessment of near vision. A simplified near vision chart with a few print/ symbol (illiterate E card) is currently used by teachers. When a low vision person considers reading as a task that may occur even as close as half an inch from the eyes.

The test is to differentiate between :

1. Those people who can see normal print.
2. Those people who can read large print without aids
3. Those people who require magnification devices or are able to read very large print.

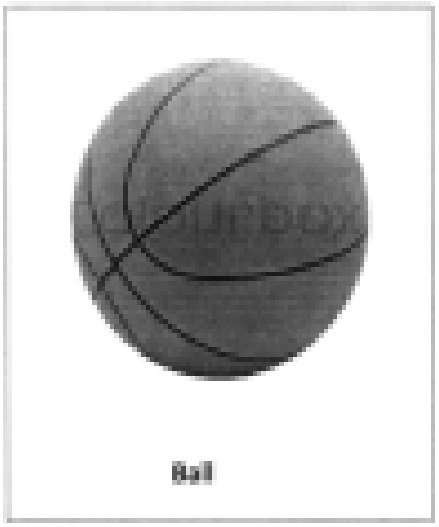
4. Those unable to read print with magnification devices or need Braille.

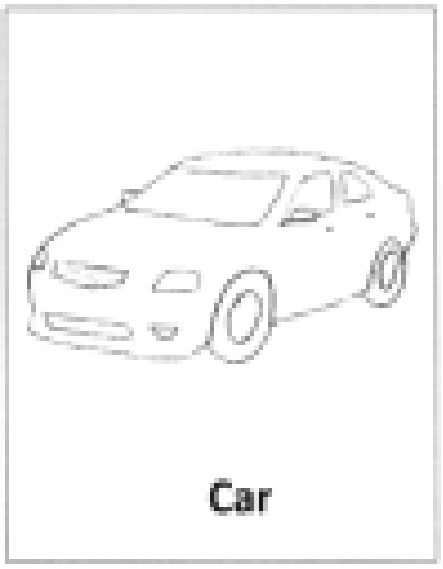
**Independent Visual Reading**

A child who is ready to begin reading will still need visual training in addition to techniques used in reading.

1. Activities to promote association of word symbols with objects and action pictures.

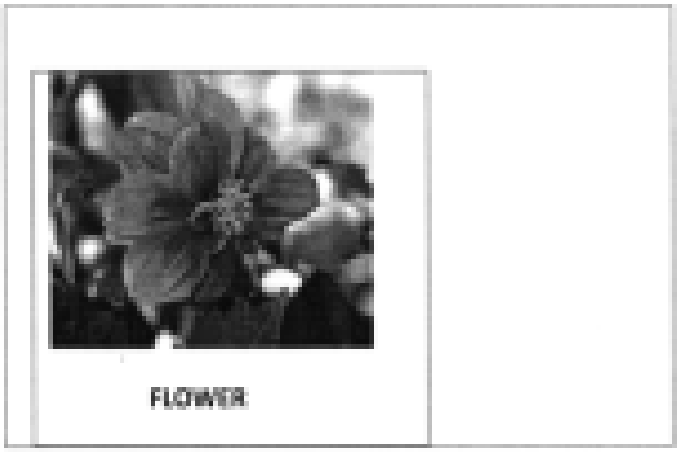
Use pictures of previously recognized objects accompanied by appropriate words.

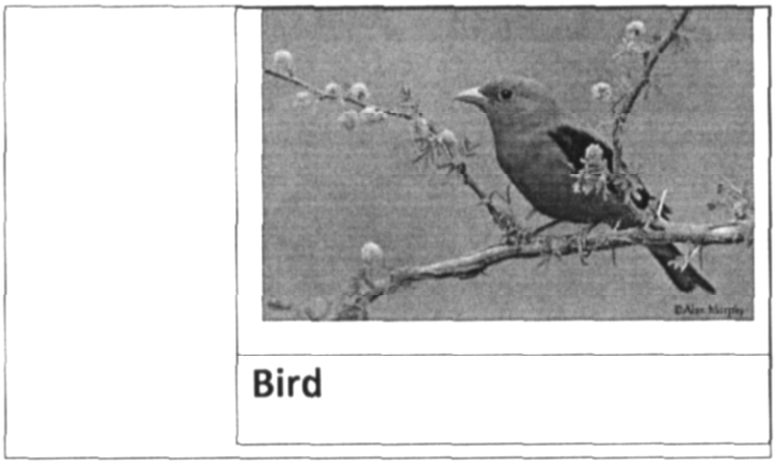


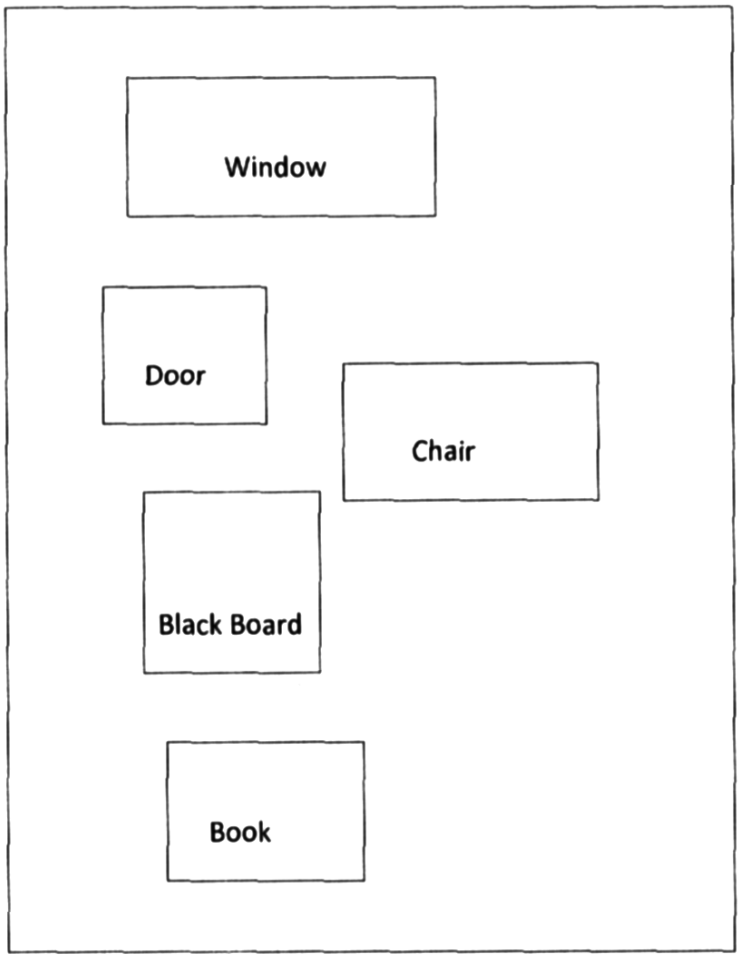

a) Teach Related Words to pictures :

Play a variety of games in which children match words to pictures using pictures cards and word cards.

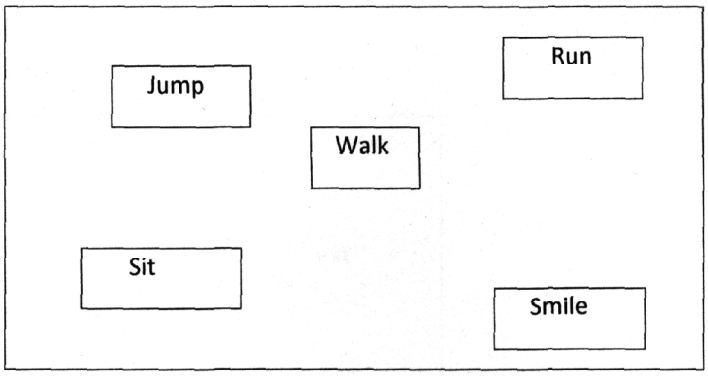





(b) Affix labels to things in the Classroom:



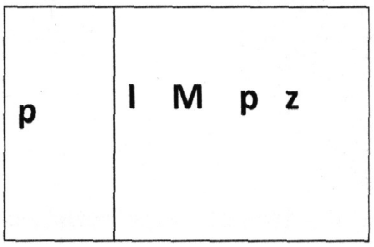
Action words can be written on individual cards for the child to choose and act out.



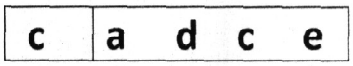

2. Activities to promote discrimination, recognition and identification of individual letter and word.

a) Match letters:

Present letter in unlike configuration

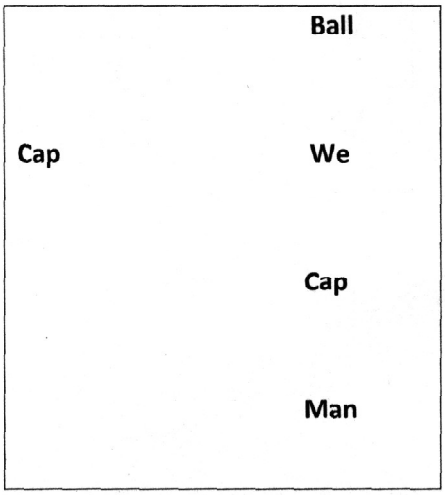



Present letter in like configuration




b) Match words:

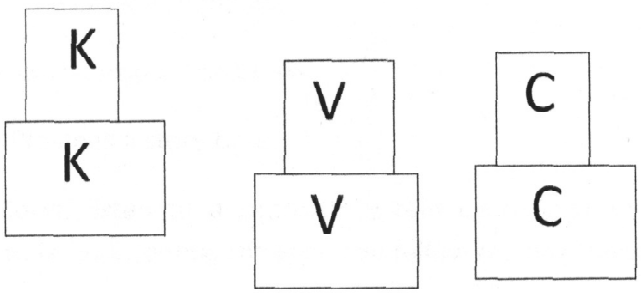
Unlike words



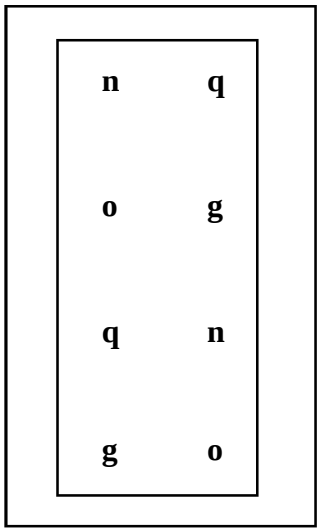
Like Words :

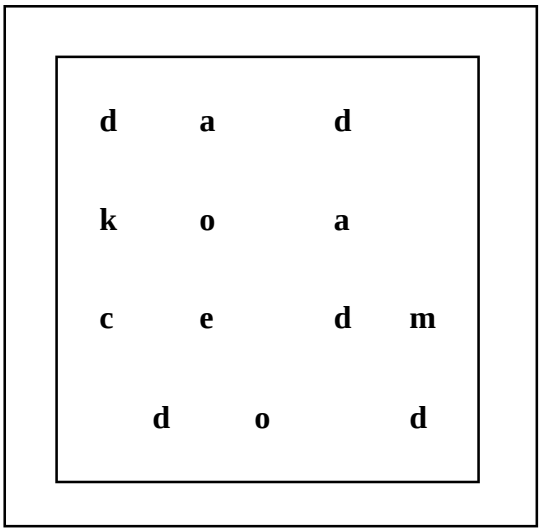
| | |
|---|---|
| | eat |
| | dot |
| Cat | cat |
| | ate |

**(c) Sort letter cards into proper letter sorting boxes :**



**Match letters in work pages**




**3. Activities to foster and encourage visual reading of simple materials**

(a) Use known songs, verses and stories which children can read from memory.

(b) Make flash cards of words taken from the song/ story and make the child build sentence.

| | | | | |
|---|---|---|---|---|
| Crow | Thirsty | Forest | Pot | water |

e.g. The Crow was thirsty.

(C) Begin using textbooks.

(d) Provide a story time.

Children listen to a short story told by teacher or by an audiocassette. When they have completed listening, the child can follow reading the same story.

**4. Activities to increase reading speed**

The slow reading rate attained by most children with impaired vision is a major frustration. Speed reading techniques must be started early - before bad habits have already been formed. The aim of reading is not the single words which combine to

express these reading. Reading speed a minimum of 20/25 words per minute is needed for comprehension.

**Therefore:**

a) Systematic Scanning techniques which develop the ability to spot key words. Phrases, sentences and paragraphs need to be devised.

b) Teach children to use principles of continuity and context to make intelligent guesses.

c) Encourage use of configuration clues.

d) Teach children to avoid sub - vocalization which concentrates attention on single words and parts of words rather than ideas expressed.

e) The use of line marker/ typoscope offers help to reduce glare and increase contrast and readability

f) Develop good listening skills for more effective use of recorded materials and reader service.

g) If visual aids are available, develop skill in the use of the devices.

**Activities to Develop Independent writing Skills**

Activities for writing can be given simultaneously along with reading activities.

All eye-hand coordination activities prepare children for writing. These activities should be continued throughout the writing programme.

Reinforce pre - writing activities before actual writing letters start.

**Some of the writing devices which improve contrast and facilitate writing are:**

- Bold - tipped/ Fibre- tipped pen
- Black Ink
- Line Guide
- Bold Line Paper
- Writing slate used by sighted children and chalk
- Neck magnifier
- Closed Circuit Television
- Type writer
- Computer

## 5.6 Orientation and Mobility for Low Vision Children

Orientation means an awareness of position in space. Mobility means the ability of moving around through the environment safely, efficiently, and independently. Not all persons with low vision need orientation and mobilitytraining but those who are unable to move with ease, independent mobility is achieved by gradually exposing them to increasingly complex situations.

Successful mobility depends of effective use of visual information rather than a visual acuity. Even minimal visual function such as light perception can be useful. The important in visual functions are influence of visual field, visual acuity, lighting and contrast sensitivity. Of these four variables, peripheral field defect, light levels and contrast sensitivity are more closely related to mobility than is acuity.

### 5.6.1 Assessment Strategies

The mobility assessment is the first step designing a mobilty programme. Instruction may be brief or extended over aperiod of months depending on the age,goals and abilities. First the mobilty Instructor/Special educator can conduct an interview to uncover problems in mobilty related to eye condition and psychological difficulties.

### 5.6.2 Functional Assessment in Mobilty

A functional assessment is very important which is to be conducted indoors and out-doors under actual travel conditions. The functional assessment is to evaluate the child's use of visual information and ability to draw on previous experiences.

**The functional assessment includes the following areas:**

- Identification and avoidance of obstacles
- Estimation of distances.
- Negotiation of steps, curbs and uneven surfaces.
- Ability to explore form one point to another.
- Lighting needs, and adjustment to variable light condition
- Discrimination of contrast
- Scanning skills
- Use of aids.

- Use of inputs in other senses
- Ease and speed of travel.

The best assessment is to hear what the Low vision person is telling about their needs, desire, problems etc. The Instructor should also observe the person in the environment. But keeping those in mind and record, it is more important to analyze actual performance

Discrepancies may exist between the answers to interview questions and actual performance that could give the evaluator a basis for discussing realistic limitations with the low vision person and designing a practical programme around those limitations.

### 5.6.3 Training for Adult and Children

The adult does not have to be "tought" to see because spatial concept is usually intact, visual memory and previous experiences are stored. A typical programme for an adult includes training in efficient use of vision and hearing, travel skills in the neighbourhood and using public transportation, sighted guide techniques, the use of long cane and use of visual aids.

Children, particularly those whose low vision is congenital or of early onset, need intensive training. A typical programme for a child or young person includes visual simulation, body image, concept development, body movement, sensory training of non- visual senses, independent travel in the known environ ment, use of visual aids for example use of hand magnifiers to read maps, addresses, telephone numbers etc., and use of mobility techniques such as cane travel and sighted guide.

### 5.6.4 Mobility Aids and Techniques

#### 1. Conventional Glasses

Conventional spectacle is first prescribed by the eye care specialists to provide the best possible base line visual acuity.

#### 2. Aids that control Light

The visual aids that modify light, increase contrast or reduce glare includes visors, wide brimmed hats, sunglasses, frames with side shields and telescopes. For persons who are night blind, abright light source from flash/ torch light may enable the person travel without cane.

### 3. Magnification Aids

Monocular telescopes or head-borne bioptic telescopes may enable the low vision persons to localize, focus and track.

### 4. Minifiers

A person with peripheral field loss can see the effect of minification by reversing a low-power monocular telescope. Minifiers are specially designed to reduce the image size horizontally, which expands only the lateral periphery of the field of vision.

### 5. Fresnel Prism

A Fresnel prism is a series of prisms compressed into a flat plastic membrane. These are accurately placed on a pair of glasses in the area of a non- functional field of view. Do not interfere with the person's regular vision. The person who is using this, however, with a quick movement into the prism can see objects at the side without any head movement. The prism in effect,defect light rays and cause those objects at one's side to appear in front of the person for easy viewing.

This visual mobility aid is useful for those with severe constricted visual field caused by Retinitis Pigmentosa, Advanced Glucoma, and less severe case like hemianoptic ( half vision) field defects.

**Non - visual Aids and techniques**

Some low vision persons may have to use non- visual technique to supplement vision under some conditions such as absence of light, unfamiliar place or uneven terrain etc. Some of the non- visual aids and techniques are :

### 1. Sighted Guide

A sighted guide technique allows the low vision person to travel comfortably with a companion. Person with periphereal field loss appreciate a sighted guide in poor lighting and a new situation. Older people are often more comfortable with sighted guide.

### 2. Long Cane

The long cane, traditionally associated with blindness, can be used by persons with low vision. A person with night blindness who is able to get about easily during the day needs a cane in dim light or at night. A person with a limited visual field may more freely use residual vision for general orientation and a cane for obstacle and curbs detection.

- **Protective Arm Technique**

The protective arm technique is used to avoid injury to the upper and lower body. This technique is to be used if the person's acuity is insufficient for the occasional situation when no sighted guide or cane is available.

- **Trailing**

Trailing is following a wall or other surface with the back of the hand.

Trailing allows a person to remain in contact with physical guidelines to avoid becoming disoriented.

**Adaptations for optical visual functioning**

1. Illumination - the amount, direction and changes in lighting conditions are crucial for optimal visual functioning.
2. Wearing absorptive sun lenses which block ultra-violet and infra-red light rays significantly increases functional acuity. In addition it reduces the amount of time it takes to adjust from indoor to outdoor lighting and vice versa.
3. Wearing wide - brim hats or visors, or even using umbrella in the sun help to increase functional acuity and protect one's eye from glare.
4. When trying to discern an object, person or sign, position oneself in such a way that the sun comes from behind the person. Change angle of viewing to facilitate best position.
5. In dim light situations such as some rooms, restaurants and cinemas, use a portable light source such as a penlight or flashlight for spot checking. Appropriate sighted guide or cane techniques are also recommended in these situations where a person is rendered functionally blind.
6. Depth perception - judgement of presence of drop-offs such as curbs, steps and uneven terrain - is affected not only by the person's reduced visual acuity or fields, but by changes in lighting and contrast.
7. A cane is particularly helpful in these situations as it frees the persons in front of you is helpful especially if that person suddenly appears higher or lower in one's visual field or moves sharply to the right or left, indicating the presence of up and down steps, curbs or uneven terrain.

8. A broken shadow in one's line of path may be indicative of stairs. (E.g. the shadow of pole on a flight of stairs will appear as uneven and broken, not as a straight line.)

**Bumping into Obstacles**

If vision is always directed downward for safety purposes, using a cane allows freedom to scan more effectively and cover a wider path. Following the shoulder line of a person with distinctly contrasting or vivid colour clothing provides movement clues to avoid possible objects

Learning to visually scan is a systematic search pattern as opposed to random, inefficient use of visual skills for visual cues in the environment.

## 5.7 Classroommanagement - Seating arrangement, adjustable furniture, illumination, non-reflecting surfaces and colour contrast.

Low vision is a complex area within the field of visual impairments. Individuals with low vision can have very different amounts of vision and ways of seeing. Therefore, some environmental modifications are required. In case of low vision children extra care is required.

Environmental modifications are used to improve the independent functioning of children with low vision. The environmental modifications should be provided within the environment where they will be, including home, community, and workplace. The low vision devices help the low vision children to use their vision more effectively.

### 5.7.1 Environmental Influences :

A child with low vision may experience difficulty in acquiring concepts. Vision is an organizing sense that allows us to perceive objects at a distance and to make connections between these objects. Many concepts developed in childhood are learned incidentally through vision. If the visual sense is impaired, concepts may be incompletely developed or missed entirely. Because of this, it is important for children with low vision to directly experience as much of their world as possible and to receive augmented instruction in making connections between objects and processes.

### 5.7.2 Classroom Management

**(A) Lighting :**

Due to age- related changes in the cells of the lens and retina, most older adults require up to three times as much light as a 25 year old. Without adequate lighting, it may be difficult for an older adult to see adoorsill in dim light or read the fine print on a medicine bottle. Unfortunately, many older adults, accustomed to conserving energy in the depression years, still live in minimally lit surroundings. Adding the correct type of lighting is one of the easiest and yet most powerful home changes we can make. Most of the products suggested below are available through local hardware, home remodeling centers or specialty stores.

- The simple addition of extra light fixtures or higher wattage bulbs, can make all the difference in aperson's visual acuity. A 100 or 150 watt incandescent light, shining directly on the task at hand, may be appropriate for a reading lamp. More lighting is required in some cases i.e. Retinitis pigmentosa
- To increase the amount of overall lighting, a torchere, an uplight which bounces light off the ceiling to other parts of the room, is an excellent solution. Until recently, torchere lamps were only manufactured with halogen bulbs which, due to the bulb's high temperature, posed serious fire risks. Today torchere lamps are available with colourcorrected fluorescent bulbs, a safer alternative to halogen.
- Reduce fumbling around in the dark during a power outage by installing a plug - in emergency light : the battery back - up unit turns on automatically during a blackout.
- If there is no light switch at the entrance to a room, add a wireless wall switch at the doorway.
- Use nightlights to light the pathway from the bedroom to the bathroom.
- In recreation and reading areas , provide plenty of floor lamps and table lamps.
- Advise people who are visually impaired that light should always be aimed at the work they are doing, not at the eyes.
- Place mirrors in such a way so that lighting doesn't reflect off them and create glare.

- For window coverings, use adjustable blinds, sheer curtains or draperies, because they allow for the adjustment of natural light.
- Keep a few chairs near windows for reading or doing hand crafts in natural light.
- The light should come behind and to one side of the person.
- Dim or appropriate light is required in some cases i.e. Albinism

(B) **Seating Arrangement :**

- The children can be placed in the middle of the front row.
- Not all low vision children prefer the front row.
- Children with tunnel vision will be comfortable when they sit little back and on the sides depending on the dominent eye.
- The children can sit where light comes more- near the window ordoor to use light.

(C) **Colour contrast:**

Colour, used as a visual identification system, can be a valuable tool in helping adults who have either low vision or difficulties with depth perception. Use strong colour contrasts to highlight where one surface begins and another ends : a dark wooden toilet seat against a white floor or ared plate against awhite tablecloth are examples. Contasting colours can be used for a wide range of household items and architectural features including doors, doorknobs, counters and tabletops, chair fabrics and bedspreads. Low-cost solutions include highlighting on/off contols with red nail polish and using glow-in - the - dark tape around the edge of tables and light switches.

- Place light objects against a dark background, a dark table near a white wall, for example, or a black switchplate on a white wall.
- Install doorknobs that contrast in colour with doors for easy location
- Paint the woodwork of the door frame a contrasting colour to make it easier to locate.
- Mark the edges of all steps and ramps with paint or tape of a highly contrasting colour.

(D) **Furniture :**

**Blackboard**

- The blackboard should be cleaned regularly.
- Writing should be clear, large and uncluttered.
- White or yellow chalks provide the best contrast.
- Arrange furniture in small groupings so that people canconverse easily.
- Make sure there is adequate lighting near furniture
- When purchasing new furniture, select upholstery with texture when possible. Texture provides tactile clues for identification.
- Avoid upholstery and floor covering with patterns. Stripes and checks can create confusion for people who are visually impaired.
- Use brightly coloured accessories, such as vases and lamps, to make furniture easier to locate.

(E) **Elimination of Hazards**

- Remove electrical cords from pathways or tape down for safety.
- Do not have polished floors ; use nonskid, non glare products to clean and polish floors.
- Keep desk chairs and table chairs pushed in.
- Move large pieces of furniture out of the main traffic areas.

(E) **Hallways and Stairways**

- In hallways , make sure that lighting is uniform throughout.
- Place drinking fountains and fire extinguishers along one wall only throughout hallways to allow individuals who are visually impaired to trail the other wall without encountering obstacles.
- Install grab bars or contrast tapes where they may be needed.
- Light stairways clearly

## 5.8 Let us Sum Up

Approximately 90% of individuals with visual impairments have functional low vision, just 10% are functionally blind. However, students with low vision are often an over looked majority in the population of children who are visually impaired. Difficulties of students with low vision are often not as apparent as they are for students who are blind. None the less, students with low vision require direct instruction in literacy, visual efficiency, accessing the core curriculum, compensatory skills and more there are many approaches for instructions.

Teacher of students with visual impairment has a bigger role to play. They can beyond individualized education programme (IEP). One of the principal concerns for students with low vision is their ability to access the visual environment. Specific assistance is essential to negotiate such issues. Access to information is another important area where specific attention is required. Access to the core curriculum is the next issue which require specific. Providing optical device, preferential seating and handouts containing pertinent information are always helpful. In science subjects' hands on activities are very much useful and effective.

Some specific interventions to achieve expanded core curriculum areas are very much significant; such areas may be compensatory or functional academic skills, social interaction skills, independent living skill, recreation and leisure skill, career education skills, use of assistive technology skills etc. All such issues and others aspects which are pertinent for teaching of children with low vision have been addressed here adequately.

## 5.9 Check your progress

1) Write down the importance of early identification and intervention programme for children with low vision.
2) Briefly explain the clinical evaluation of low vision using the equipment in Clinic.
3) Explain the procedure for screening of impaired vision with the commonly adapted test.
4) What is functional vision? How do you assess the visual skills?
5) Describe the method of selecting items/materials for the functional assessment

and enumerate the points to be borne in mind while administering the test.

6) What is visual stimulation?

7) Explain the role of teacher in managing the class with low vision children.

8) What is visual tracking? Explain with an example.

9) Write down the use of aspheric lens for vision training.

10) Describe the concept development of the Visually Impaired Child.

11) State a few modifications needed in the home environment to facilitate visual task of low vision child.

12) List the mobility aids and techniques used for effective movement of low vision persons.

13) What are the procedures followed to develop writing skills for low vision children.

14) Describe the procedures of selecting appropriate learning medium of low vision children

## 5.10 References


1. Mittal S.R. : Education of Children with Low Vision
2. K.K. Paknikar : Performance Tests for the Blind
3. Singh A. K. : Tests, Measurement and Research Methods in Behavioural Sciences
4. Ramesh Sathe : Low Vision Care ..... As I look at it.
5. Lowenfeld Berthold : The Visually Handicapped Child in School.
6. Gur Lulla Dr. Sunita : Guidance for Comprehensive Management of Low Vision in India ( A Vision 2020 : The right to sight)
7. Burgara, N.C : Visually Handicapped & Learning
8. Randall T. Jose (1983) : Understanding the Low Vision. New York : American Foundation for the Blind
9. Mani M.N. G. : Reading Preference Test (REPT) for Children with Low Vision.

# Notes

মানুষের জ্ঞান ও ভাবকে বইয়ের মধ্যে সঞ্চিত করিবার যে একটা প্রচুর সুবিধা আছে, সে কথা কেহই অস্বীকার করিতে পারে না। কিন্তু সেই সুবিধার দ্বারা মনের স্বাভাবিক শক্তিকে একেবারে আচ্ছন্ন করিয়া ফেলিলে বুদ্ধিকে বাবু করিয়া তোলা হয়।

*— রবীন্দ্রনাথ ঠাকুর*

ভারতের একটা mission আছে, একটা গৌরবময় ভবিষ্যৎ আছে, সেই ভবিষ্যৎ ভারতের উত্তরাধিকারী আমরাই। নূতন ভারতের মুক্তির ইতিহাস আমরাই রচনা করছি এবং করব। এই বিশ্বাস আছে বলেই আমরা সব দুঃখ কষ্ট সহ্য করতে পারি, অন্ধকারময় বর্তমানকে অগ্রাহ্য করতে পারি, বাস্তবের নিষ্ঠুর সত্যগুলি আদর্শের কঠিন আঘাতে ধূলিসাৎ করতে পারি।

*— সুভাষচন্দ্র বসু*

Any system of education which ignores Indian conditions, requirements, history and sociology is too unscientific to commend itself to any rational support.

*— Subhas Chandra Bose*

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