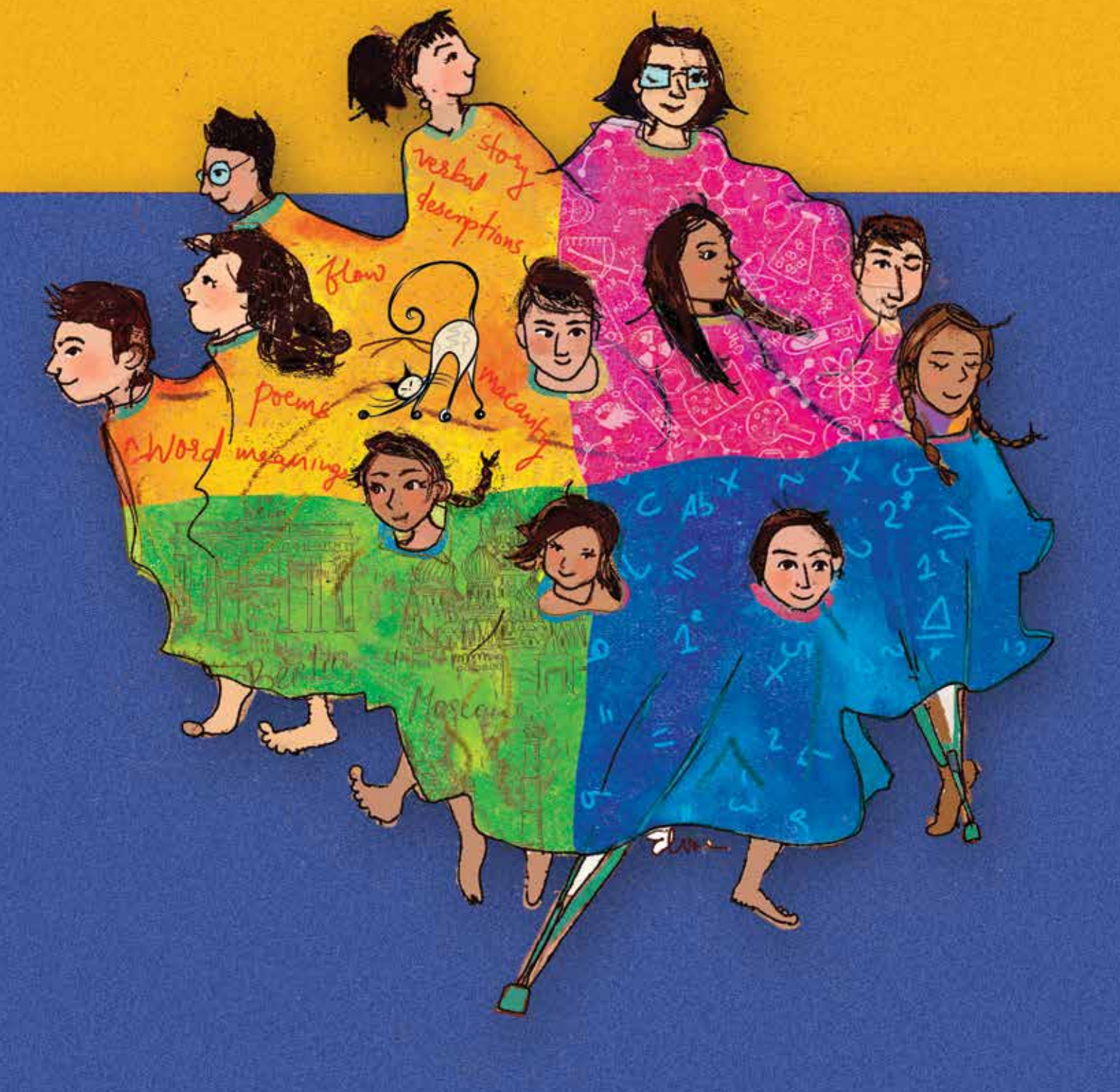
Including Children With Special Needs

Upper Primary Stage



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INCLUDING CHILDREN WITH SPECIAL NEEDS

Upper Primary Stage

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NCERT

Department of Education of Groups with Special Needs

राष्ट्रीय शैक्षिक अनुसंधान और प्रशिक्षण परिषद्
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FOREWORD

All children including Children With Special Needs (CWSN) have an equal right to gain access to quality education and opportunities to succeed in life. We all realise that many CWSN are still being left behind in our education system. Improving the learning processes for these children requires effort at many fronts, supporting students in their learning through the use of inclusive curriculum and pedagogy has been proved very effective. The main objective of this handbook is to help teachers to make their classrooms and teaching more inclusive. In 2014, the handbook Including Children with Special Needs: Primary Stage was launched. Since then, many rollout workshops – three at the regional levels and one at the National level – have been conducted to prepare the key resource persons on inclusive teaching strategies. The handbook is highly appreciated by teachers, teacher educators and found helpful in making the teachers understand the learning needs of students, to adapt their pedagogical knowledge and practices and to engage all students in meaningful learning experiences.

The present handbook, Including Children with Special Needs: Upper Primary Stage is a step forward and provides tips and strategies for gaining access to various subjects like Languages, Mathematics, Social Sciences and Science at the Upper Primary level of schooling. While the earlier book introduced teachers to the nature of impairments and offered suggestions and guidelines for creating inclusive classrooms, the present book offers suggestions regarding meeting the learning needs of children with sensory, cognitive, intellectual and physical disabilities in different subject areas.

This handbook emphasises access and participation of children in the learning process more than just placing them in schools. Series of workshops were held in different parts of the country involving regular school teachers, teacher educators, special educators, and experts from universities, non-governmental and governmental organisations. In addition, various researches and documents across the world were consulted. It was reviewed by teachers through focus group discussions held in different parts of the country. The handbook is based on the foundation that learners actively construct their own knowledge by connecting new ideas to existing ideas on the basis of materials and activities presented to them. It also emphasises collaborative learning that provides space for interactions, sharing of multiple views and learning from each other.

In this way, no child feels awkward and segregated and is able to contribute to the learning process in his or her own way.

We highly appreciate the contribution of Professor Anita Julka and her team in preparing such academic material. The NCERT thanks all the teachers and experts who have contributed ideas for this handbook. The council welcomes all suggestions towards the improvement of this handbook.

B .K. TRIPATHI
Director
National Council of Educational
Research and Training

New Delhi
May 2015

PREFACE

Educational Initiatives, at the Central and State levels, in both public and private schools, have to respond to major changes brought in by the Right to Education Act (RTE), 2009 and amendments of 2012. The RTE provides for 1) development of curriculum in consonance with the values enshrined in the Constitution, through a system of child friendly and child centred learning; 2) assessment by teachers of the learning ability of each child and accordingly supplementing with additional teaching, as required; 3) continuous and comprehensive evaluation of the child's understanding of knowledge, and his or her ability to apply the same.

The work on the present handbook was initiated after the completion of the earlier distinctive project that led to the development of the book Including Children with Special Needs: Primary Stage. The present handbook, Including Children with Special Needs: Upper Primary Stage, was prepared as one of the major priorities in the field of inclusive education to equip the teachers not only to work with the children with special needs (CWSN) but to develop a vision of a learning culture which enables all students with different abilities and characteristics to achieve their full potential. This handbook pools in the expertise of both resource teachers and regular school teachers to make it a useful and inspiring resource for teaching learning in inclusive classrooms. Although it is structured around different disabilities, the tips and strategies are useful for all children in the classroom. These strategies contribute to an overall inclusive learning environment.

During the development of this handbook, over 200 teachers, including resource teachers, and over 50 academic experts, from universities as well as non-governmental and governmental organisations, were consulted. The enthusiasm and positive engagement of regular classroom teachers working in collaboration with resource teachers in workshops has shaped this book in its current form. A number of examples are given that demonstrate how to change the current teaching practices in inclusive classrooms, and support students to become independent learners and actively participate in the learning process. The handbook can be used as a resource to be integrated in the classroom practices at all levels.

Do You Know ?

According to the 86th Constitutional Amendment Act, 2002, free and compulsory education for all children in 6-14 year age group is now a Fundamental Right under Article 21-A of the Constitution.

EDUCATION IS NEITHER A PRIVILEGE NOR FAVOUR BUT A BASIC HUMAN RIGHT TO WHICH ALL GIRLS AND WOMEN ARE ENTITLED

Give Girls Their Chance !

ACKNOWLEDGMENTS

The production of this document was initiated and supported by Ms. Vrinda Sarup, *Secretary*, Department of School Education and Literacy, Ministry of Human Resource Development (MHRD) and Dr. Meenakshi Jolly, *Director*, MHRD. We also appreciate and acknowledge the financial contribution made by MHRD for this project.

The development of the handbook involved a large number of individuals representing a range of stakeholder groups – regular school teachers, resource teachers and other experts from universities, non-governmental organisations and other Institutions like National Association for the Blind, Ali Yavar Jung National Institute for the Hearing Handicapped and National Institute for the Mentally Handicapped, who gave inputs for the handbook through various workshops. We are grateful for the contributions made by the participants of these workshops whose names are included in Annexure-1. Moreover, the development of this handbook in its present form, could not have been possible without the active participation of Professor Anupam Ahuja, *Head*, DEGSN, Mr. Vinay Singh, Associate Professor, DEGSN and Dr. Bharti, *Assistant Professor*, DEGSN. We wish to express our gratitude to them.

The specific contribution of the following experts in the development of the handbook is also gratefully acknowledged.

Mr. B. Eswaraiah, *Senior Academic Programme Officer*, Rajiv Gandhi Foundation Regional Centre, Telangana and his team, for support in developing the section on Continuous and Comprehensive Evaluation (CCE).

Ms. Sheetal Batra, *Coordinator* and Ms. Mohita Mitla, *Associate*, Action for Ability Development and Inclusion (AADI), for their valuable inputs in creating the section on Physical Disability.

Dr. Anupriya Chadha, *Chief Consultant*, TSG-EDCIL, for her interest and contributions.

An initial draft was reviewed in three focus group discussions involving regular school teachers (the first one in Rajasthan, the second in Maharashtra and the third in Telangana). Teachers provided written comments, which have been incorporated in the document. We thank these teachers for giving timely feedback for refining the contents of the document. Special thanks are also due to Mr. Ajay N. Kakade, *State Coordinator* (IE) ,

Maharashtra, Mr. Naveen Kumar Gautam, *State Coordinator* (IE), Rajasthan and T. Subhashini, *State Coordinator* (IE), Telangana, for supporting us with their resources and cooperation in organizing the focus group discussions.

Finally, we would like to offer our special thanks to Ms. Shweta Rao who designed the entire handbook and made it look so lively, and Ms. Usha Nair for editing the handbook and providing feedback promptly.

CONTENTS

Nirmalya Chakraborty, College of Art, New Delhi

Introduction

Inclusive culture helps in accommodating more and more students in the classroom. What is important is challenging and stimulating yourselves and the students, achieving better clarity and performance.

"Inclusive education means education of all students, where all students are equal participants in the learning process... This right is upheld by the Indian Constitution..."

Why should you read this handbook?

Inclusive education means education where all students are equal participants in the learning process. Provision of inclusive education is based on the belief that those with disabilities should not have to depend on specialised services alone to benefit from educational resources, activities and practices that are otherwise available to all. Inclusivity is maintained when all members of a group are able to participate in its activities, which means provisions made are considerate of all members and not just those from specific groups or with special abilities, disabilities and/or needs (Julka, 2014). Inclusion is a process or a key strategy to reach out to all children and support their learning.

For the past several years we have been striving to include children with disabilities in the mainstream educational settings. The issue of inclusion in education generates a lot of discussions and debates, much more than any other issue. While inclusion is advocated by professionals and supported by a number of policy and legislative frameworks, teachers are generally apprehensive about the idea of educating students with disabilities along with regular students in the same classroom. The main reason for this fear is that, for successfully meeting the diverse needs of all students in such a classroom, significant restructuring is required. Also, teachers need to be sufficiently trained to handle this.

This handbook aims to address the issue by providing the readers, in this case, regular classroom teachers, some tips, suggestions and practical strategies with examples that will support the teachers to increase the participation of all students, including students with disabilities, in the learning process. The handbook challenges the practice of segregation within inclusive education. The material in the handbook highlights how

inclusion of children with disabilites in regular classrooms enriches the teaching learning processes for all the children.

REVISITING TERMS, TERMINOLOGY AND PHRASES[1]

"...our classrooms, now more so than before, need to be ready to include students from different backgrounds, with differing needs and abilities."

Several terms and phrases related to disabilities and special needs tend to create some confusion leading to a failure in understanding. This section revisits and clarifies some terms that you are likely to come across in the work of creating inclusive classrooms.

Impairment and Disability

Two terms related to special and inclusive education that are most commonly used, often interchangeably, are impairment and disability. While impairment refers to a lesser degree of complexity in the way our bodies work, disability refers to inability or not being able to perform a task. Most of us have felt inability at some time or other in our lives: during illness, following a physical injury or, when in an unfamiliar environment. For example, during a physical injury like fracture or severe sprain, disability would involve not being able to use your limbs effectively to walk, run or write etc. Given that often these and related terms are used interchangeably, the following section offers explanations of pairs of terms often heard while referring to persons with disabilities.

- ***Impairment:*** ***(Dosh, Vikaar)*** Illness, injury, complexity arising from any difficulty in the way our body works or functions.

- ***Disability:*** ***(Nishkta)*** Disability is more than a problem or difficulty with how our body works – a child with impairment may experience disability when functioning in an environment that impacts the child's successful performance at a task. Thus, impairment alone may not cause inability to perform in a manner equal to others, but the systems within which one has to live, learn, work and operate can cause a child with impairment to be unable to perform successfully, (for example, a child with hearing impairment may be able to successfully function within own immediate contexts of family and neighbourhood, and not experience any

1 *Julka, A (2014). Including Children with Special Needs: Primary Stage, NCERT, New Delhi.*

'disability' in going through routine, day-to-day interactions, but may experience inability to perform with the same success as her classmates in a classroom setting involving expected expressions of learning.) Overcoming or successfully being able to navigate, participate, function and contribute in a school, classroom or any organised system thus needs suitable interventions for a person with impairment/s. The interventions need to be effective in reducing or eliminating challenges and barriers.

In this book, the term disabilities would include sensory disabilities, cognitive disabilities, intellectual disabilities and physical disabilities.

Assessment: ***(Aankalan)*** This involves gathering information to understand the student teacher-performance and classroom functioning, and is thus an interactive process. Assessments are formative and diagnostic in nature, that is, they provide information about students' areas of strength and help recognise the teaching-learning aspects requiring attention or improvement.

Evaluation: ***(Mulyankan)*** This involves making a value judgment on a performance which is then graded. The process is summative in nature.

Integration: ***(Ekikaran)*** In the context of education of students with disabilities, integration means providing education to students with special needs in regular classrooms. In this process, the focus is on having the child adapt and adjust to the regular classroom.

Inclusion: ***(Samavesh)*** Inclusive education refers to education for all students, where all students are equal participants in the learning process.

Adaptation: ***(Anukulan)*** Adaptation refers to adjusting assessments, material, curriculum or classroom environment, to accommodate a student's needs to enable him / her to participate in and achieve the teaching-learning goals.

Some examples include:

- use of audio tapes, electronic texts where available, having peer or a classmate to assist with class activities, or simply re-organising seating of a child who is unable to be attentive, is easily distracted or distracts others in the classroom;
- alternatives to written assignments to demonstrate knowledge and understanding (for example, through oral presentations, drawing or other artistic presentations);
- extended time to complete assignments or tests;
- computer software that provides text to speech or speech to text conversion capabilities;
- provide for multiple experiences with materials to allow for different learning styles or needs, also to help reinforce learning (for example, learning in multiple ways how plants grow, through textbooks, through hands-on experience by growing one in the class, preparing observation record of its growth and through group or whole class discussion about the on-going learning).

Modifications: ***(Sudhaar)*** Modifications involve making changes to learning goals, teaching processes, assignments and/or assessments to accommodate a student's learning needs. For example:

- changing an assignment to accommodate a student's learning needs: allowing use of letter-cards to spell words as a modification to saying the spelling aloud, allowing the student with intellectual impairment to utilise concrete and/or more hands-on experiences, changing the conceptual difficulty level for some students.

The above section offers help to understand terms frequently used in working with students with special needs and in inclusive classrooms. The following section highlights the significance of curricular adaptations at the upper primary stage of learning and explains the different subjects taught at this stage of school education.

Why Curriculum Adaptations?

Curriculum

As we begin to comprehend and incorporate some of the understandings needed to include a student with impairments in the classroom, it is important to realise the significance of the curriculum to classroom practices. Creating an inclusive culture in the classroom will involve attending to the curriculum, which incorporates the components of a course of study. The components include the syllabus, textbooks and needed teaching learning materials, teaching strategies and processes, and assessment and evaluation processes. In discussing the efforts in curricular development and reform, *National Curriculum Framework* (NCF) *2005*[2] underscores the significance of making the curriculum "an inclusive and meaningful experience for children" stating, "this requires a fundamental change in how we think of learners and the process of learning" (p. 13). Attending to the curriculum to define classroom culture and the approach to the teaching-learning processes is thus a significant aspect of your work in fostering inclusivity in the work with students.

"Creating an inclusive culture in the classroom will involve attending to the curriculum, which incorporates the components of a course of study."

Curriculum Adaptation

Curriculum adaptation involves differentiation to meet the needs of all students. The content, the teaching process, assessment and evaluation, and the physical environment may be modified to help students to achieve success in the classroom. The kind of activities chosen by the teacher, including group activities, must be flexible and reflect the background knowledge of small groups or individual students.

The fact that children learn in a variety of ways should form the guiding force behind teaching and learning processes in our classrooms. As we are in the process of implementing the Right to Education Act, (RTE) 2009[3], more and more children with different abilities from diverse backgrounds are getting included, thus changing the composition of our classrooms. In high quality inclusive classrooms for learning, adaptations in the curriculum may help some students who would not develop to their full

2 *NCERT (2005). National Curriculum Framework, New Delhi.*

3 *Government of India (2009). The Right of Children to Free and Compulsory Education (RTE) Act. Ministry of Human Resource Development, New Delhi.*

"While it is true that curricular adaptations could be one strategy to increase participation of students with disabilities in the learning process, it must be borne in mind that no two individuals with special needs have identical needs even in case of similar disability. Considering the individual differences that exist in our classrooms, any document on curricular adaptations can only be a guiding/ exemplar material that calls for teachers to reflect on their own strengths and shortcomings."

potential without these adaptations. We must remember that there is no readymade recipe for curriculum adaptations and these vary from child to child. It is also true that many students in the classroom may be able to achieve the learning outcomes with no or with very minor adaptations. Some may require adaptations in few subjects while there may be others who require different set of goals to work upon. Remember that the more inclusive the classroom, the more productive the learning experiences for all children.

Recent developments in the field of education have made many teachers anxious about including children with disabilities in classrooms. Some teachers lack the confidence to teach these children effectively while simultaneously teaching a large group of typically developing students. In an attempt to meet such challenges, documents on curricular adaptations are being prepared all over the country. This may be prompted by the mistaken belief that a document on curricular adaptations would serve as a magic wand and help our teachers meet the demands of inclusive classrooms. While it is true that curricular adaptations could be one strategy to increase participation of students with disabilities in the learning process, it must be borne in mind that no two individuals with special needs have identical needs even in case of similar disability. Considering the individual differences that exist in our classrooms, any document on curricular adaptations can only be an exemplar material that calls for teachers to reflect on their own strengths and shortcomings[4]. This way, they can identify successful strategies and their experiences would guide the daily working of their classrooms.

The following figure explains how creating inclusive culture helps in accommodating more and more students in the classroom. What is important is challenging and stimulating yourselves and the students, achieving better clarity and performance. The following diagram shows that classrooms with accommodating practices decrease the need for individual adaptations[5].

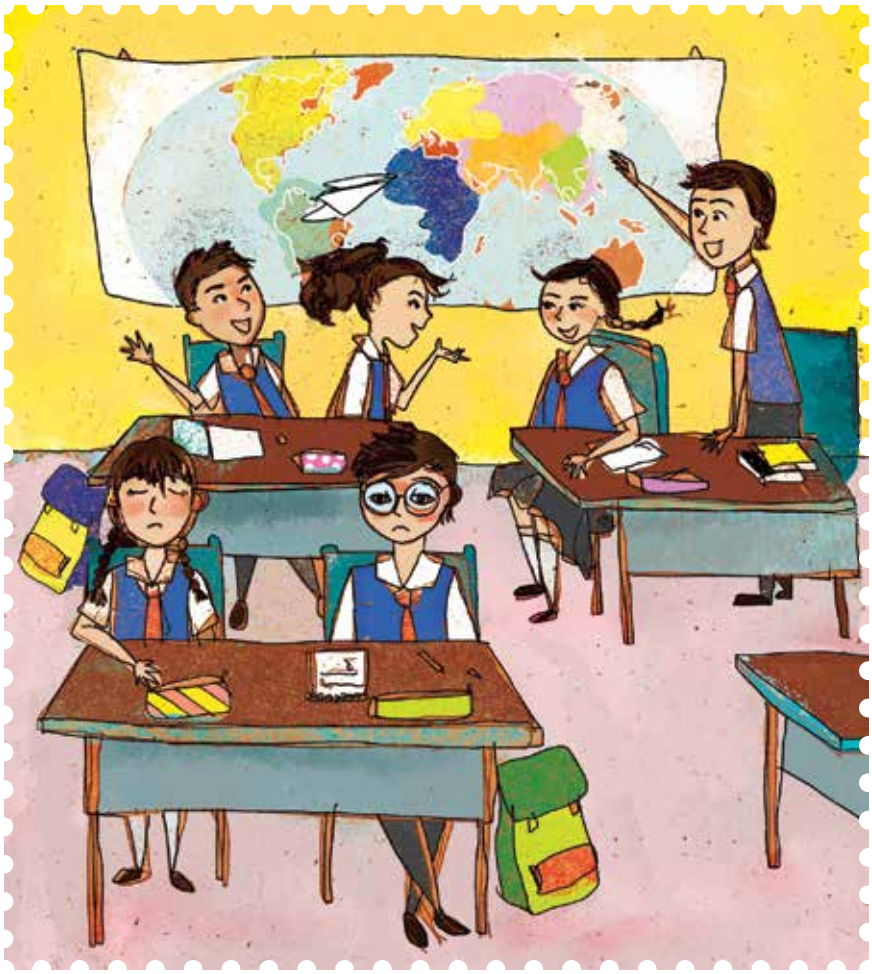
4 By adapting the curriculum you are providing access to opportunities of various kinds. You are also helping the child to develop a positive self-concept, increasing motivation and fostering better relationships. You are improving participation, supporting the student to master core concepts and making use of students' strengths, learning styles and background knowledge. Overall you are nurturing the self-esteem of students.

5 Accommodating Schools and Classrooms decrease the need for individualised adaptations (Janney & Snell, 2000).

Moreover, statistics reveal that many children in regular schools, especially children with disabilities, drop out after the fifth class [6]. The reasons for this could be many, including some related to the school or the community or the homes from where these children come. Curriculum not relevant to the children's needs, low expectations from children, teachers not taking individual styles of learning into consideration, teacher training not in tune with the latest developments or technologies etc. could be some of the school related factors. But, in spite of this, efforts are undertaken by some teachers to welcome and increase acceptance of children with disabilities in the classrooms. It is this motivation that drives teachers to visit the child's home, interact with parents and find ways to make the child participate in the class, using a number of strategies. For instance, one of the teachers stated during a discussion that she tried to change attitudes of other children by making them write essays on topics like "*Main chal nahi pata to*?" (What if I was not able to walk?). Also, some teachers have tried to create empathy through prayer meetings in the school while others have approached other children in the class to take care of their disabled peers. Some encourage participation of children with disabilities by giving them leadership (monitor) role in the classroom while others encourage collaboration amongst teachers. Some teachers also express that these children are better understood by their closest friends who can, in turn, communicate their needs to us.

6 *NUEPA (2014). Elementary Education in India: Progress towards UEE (Flash Statistics, DISE 2013-14), New Delhi.*

"Children with disabilities may often feel left-out or excluded from both peer bonding and the understanding of subject matter. The aim of inclusive classrooms is to reduce such exclusion and enrich the teaching-learning experience for all children involved."



The Upper Primary Level

The period of elementary schooling that includes classes 1 to 8 is the period of free and compulsory schooling, as defined in the RTE, 2009. At the beginning of this period the child is formally introduced to the basics of reading, writing and arithmetic. By the end of elementary schooling, the child becomes familiar with the formal disciplines of sciences and social sciences. **The upper primary period is when better defined subject areas are introduced.** During this period the child develops confidence to choose the subjects he/she likes or is good at. In making this choice, the child also acquires skills and attitudes necessary to be independent and to be effective at the work place at a later stage in life. Therefore, at this level curriculum adaptations are very critical for children with disabilities, to increase their access to the general curriculum. It is important for teachers to invite participation of all children in all academic and non-academic activities, and provide every child a sense of success. **Teachers must have high expectations from every child and should not believe that the**

presence of some will slow down the pace of others. The teacher should focus more on what a child can do rather than on what he/she cannot. The skills required for development in different domains at different stages are briefly described below [7].

Languages

During the primary years, writing abilities should be developed holistically in conjunction with the sensibilities associated with talking, listening and reading. At middle and senior levels of schooling, note making should receive attention as a skill-development training exercise. This will go a long way in discouraging mechanical copying from the blackboard, textbooks and guides. It is also necessary to break the practice of making tasks like letter and essay writing routine, thereby giving imagination and originality more prominent roles in education.

Social Sciences

At the upper primary stage, social sciences incorporate content from history, geography, political science and economics. History generally includes developments in different regions of India, along with sections on events or developments in other parts of the world. Geography, at this level, helps to develop a balanced perspective related to issues concerning the environment, resources and development, from local to global. In political science, students are introduced to the formation and functioning of governments at local, state and central levels, and the democratic processes of participation. The economics component enables students to observe economic institutions like the family, the market and the state.

Mathematics

At the upper primary stage, students get introduced to the application of powerful abstract concepts. This enables them to revisit and consolidate the basic concepts and skills learnt at the primary stage. Students get acquainted with algebraic notation and its use in solving problems, and in generalisation of the systematic study of space and shapes, and for consolidating their knowledge of measurements. Data handling, representation and interpretation form a significant part of the ability of dealing with information in general, which is an essential 'life skill'. The learning at this stage also offers an opportunity to enrich students' spatial reasoning and visualisation skills.

7 *NCF (2005). NCERT, New Delhi.*

Science

At the upper primary stage, the child is introduced to various scientific concepts that are to be learned mainly from activities (making models, field visits) and experiments. Group activities, discussions with peers and teachers, surveys, organisation of data and their display through exhibitions etc. in schools and the neighbourhood should be important components of pedagogy.

The above section dealt with the need for curricular adaptations, the curricular areas and the skills required to develop at the upper primary level. The following section highlights some important factors at this stage that may affect a child's growth and development, especially a child with disability.

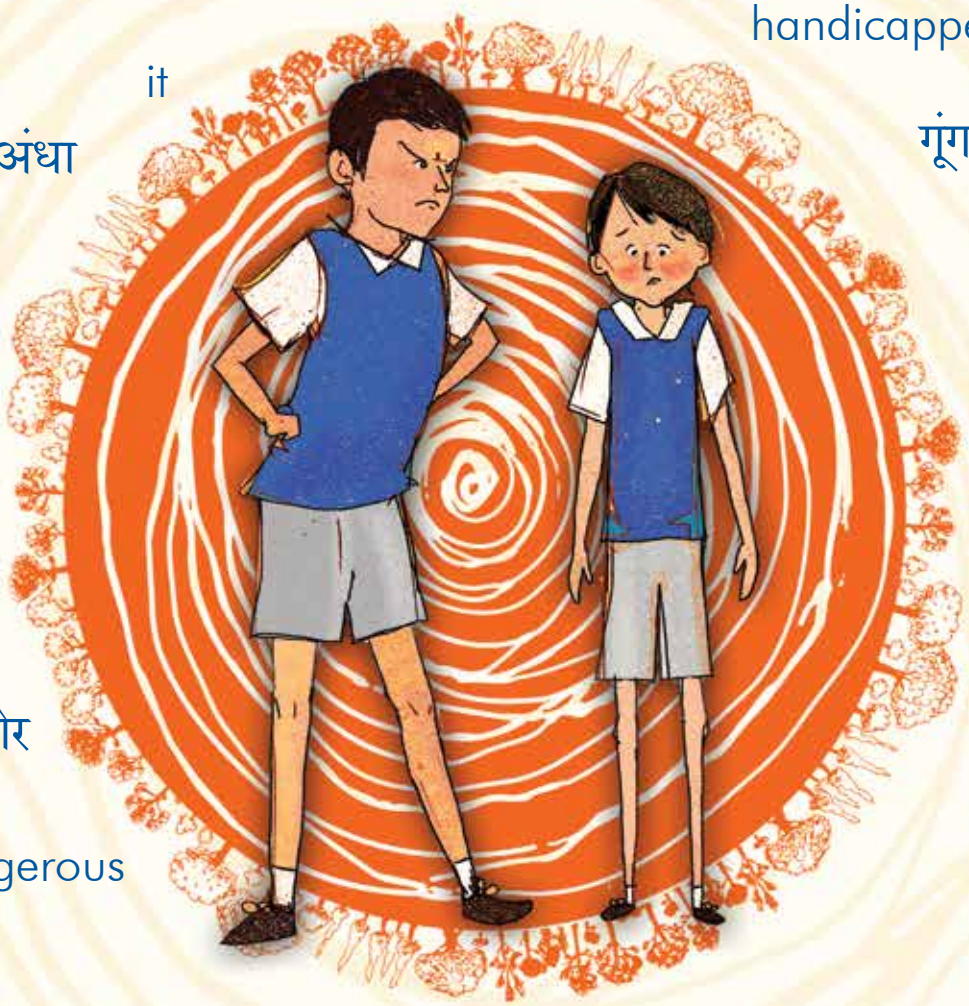
Adolescence (*Kishoreawastha*)

Adolescence is a word taken from the Latin word "adolescere" which means to grow up, and generally refers to the period between 13-19 years. It is a period between puberty and adulthood. Puberty, derived from the word puberatum (age of maturity), is the time when a number of biological and physical changes occur in a child, for example, the period is marked with development of sexual and physical characteristics that occur due to hormonal changes. The exact age when a child enters puberty varies from child to child, and depends upon a number of factors like nutrition or malnutrition, genetic makeup, social circumstances and gender. It generally occurs a little earlier in girls as compared to boys. The age of onset would also vary according to the kind of exposure the children have had.

Children with disabilities go through the same changes, but because of their impairments, the reactions to changes occurring in the body may differ from others. Although many children show a decline in self-concept during the elementary school years and while transiting to secondary level, this decline may be more significant in children with disabilities.

In adolescence children with disabilities may also show behavioural problems related to academic underachievement. These are characterized by inattention, hyperactivity, aggression, defiance, impulsivity and sometimes also anti-social features. The adolescent years are characterized by demands of higher level curriculum, which impose increasing strains on a developing and differentiating nervous system and children with intellectual disabilities often experience a profound feeling of intellectual inadequacy and sadness. This erodes both self-esteem and academic motivation of the child (Stein and Hoover, 1989).

BULLYING IN SCHOOLS (*DARANA/DHAMKANA*)



Bullying is a form of aggressive behaviour in which a person intentionally and repeatedly causes another person injury or discomfort. Bullying can take the form of physical contact, words or subtle actions. The bullied individual typically has trouble defending himself/herself and does nothing to "cause" the bullying (American Psychological Association, 2015, USA. http://www.apa.org/topics/bullying/).

Bullying is quite common in our schools and many of our children experience it in their daily lives. Children who are bullies intentionally intimidate or harass other children. It happens in all schools. It could take the form of calling names, harassing, threatening, teasing, intimidating or even physical assault. Often it is an act repeated on a daily basis or over a period of time, and may leave a major emotional impact on the child.

Students with disabilities often experience challenges of peer acceptance and are more susceptible to bullying and teasing compared to their typically developing classmates (Sullivan et al., 2014). Fear of teasing may result in lesser participation in classroom activities and interactions. In fact, researches revealed that students who receive special education services are more likely to be identified as victims or bully-victims (Farmer et al., 2012). Many students with disabilities do not possess appropriate social skills that enable them to successfully navigate through relationships in the classrooms (Brich and Ladd, 1999). Many parents prefer keeping a child with disability at home or send her/him to a special school where other children are also like him/her. They fear that their child may be bullied because of his/her physical appearance, communication, academic and social limitations. Children with disabilities may also appear to be physically vulnerable or not strong enough to protect themselves against bullying. As a result they may be targeted more often.

"...self-concept refers to a student's perception of competence or adequacy in academic and non-academic (e.g. social, behavioural and athletic) domains and is best represented by a profile of self-perceptions across domains. Self-esteem is a student's overall evaluation of him/herself, including feelings of general happiness and satisfacion (Harter, 1999)."

Bullying in schools affects the child in many ways. Some children feel sad or anxious; others may show poor academic achievements. Some may even skip or drop out of school. Also, children with disabilities may already have very few friends in school and they may not want to complain about bullying, due to fear of losing their only friends.

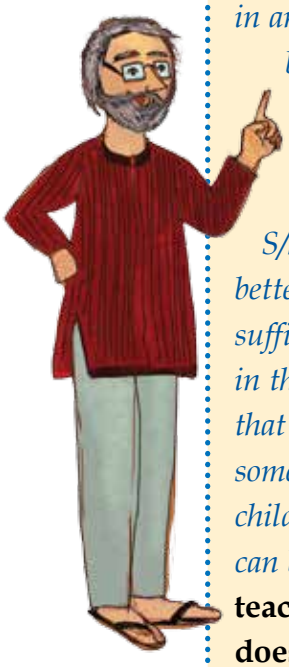
Self-concept and Self-esteem

Although the terms self-concept and self-esteem are used interchangeably, especially in our country, they have somewhat different meanings. To be more specific, self-concept refers to a student's perception of competence or adequacy in academic and non-academic (e.g. social, behavioural and athletic) domains and is best represented by a profile of self-perceptions across domains. Self-esteem is a student's overall evaluation of him/herself, including feelings of general happiness and satisfaction (Harter, 1999).

A teacher can help in developing positive self-concept by caring and supporting the academic and social efforts of a student. If the school and class have a welcoming environment wherein diverse abilities are respected, social relationships amongst students are nurtured, and the school is like a caring community, all children feel encouraged.

Feelings of low self-concept can be reduced by a teacher who encourages her students by giving positive feedbacks. Classroom interventions, such as peer tutoring and cooperative learning, may promote self-concept by increasing students' academic skills and perceptions of social support (Elbaum & Vaughn, 2001).

One of the concerns expressed by the teachers is the practice of hygiene and cleanliness of some children, especially of children with intellectual disabilities. At times these children are unable to learn to take care of their daily routines. Other concerns that affect the child's learning are the inability to read and write in Braille, or communicate in sign language. Collaboration with special teachers and parents helps in overcoming some of these challenges.



There is no universal solution for the challenges faced by teachers in an inclusive classroom. What a teacher can definitely do is to be thoughtful, sensitive and unbiased. S/he needs to be deeply committed to the belief that all children can learn, and have high expectations from all her/his students and convey these expectations to the children. S/he should also reward successes; that will help in developing better self confidence in children. S/he should also provide sufficient meaningful opportunities for all children to participate in the learning process. S/he may use teaching learning strategies that are suitable for most of the children in the classroom with some additional or different ones, rather than remove some children from the class for learning in segregated settings. This can be achieved by giving choices of activities to everyone. **The teacher should understand and believe that disability does not mean being useless or helpless.**

In the above section we have discussed some issues that may affect the child's learning at the upper primary level. The following section explains the structure of the handbook for adapting curriculum at the upper primary level.

STRUCTURE OF THE HANDBOOK

As mentioned earlier, upper primary stage is the period when emergence of better defined subject areas takes place and the child gets ready to make choices. The transition from primary to upper primary is successful when children have developed friendships and the confidence to learn. It also depends upon the continuity of curriculum and settling well in schools.

This handbook is organised around two sections. The first section offers tips and strategies for adapting language education, social sciences, mathematics, sciences in inclusive classrooms which have students with specific needs related to sensory disabilities, cognitive/intellectual disabilities and physical disabilities. The second section explains Continuous and Comprehensive Evaluation (CCE) and offers a few suggestions on how it can be utilised for an inclusive classroom at the upper primary level.

The following paragraphs present a brief overview of categories of special needs as addressed in various sections of this handbook (Julka, 2014).

Sensory Disabilities

Sensory disabilities arise when a child is unable to perform successfully due to impairment of the senses. Sense organs enable one to see, taste, smell, hear and feel the sensations of heat, cold, touch, pain, pressure etc. Various sense organs receive information from the environment and, along with the brain, are parts of the Central Nervous System, a highly organised and complex system in our bodies (Gray 1918, p. 721). Among the senses, impairments to the senses of sight and hearing, i.e. visual impairment and hearing impairment, have considerable implications for teaching-learning in the classroom; we rely significantly on both these senses - of hearing and sight - for our learning.

The handbook offers suggestions and guidelines related to vision and hearing impairments. Information includes:

(1) understanding the specific needs of these groups;

(2) some strategies for teaching different subjects at the upper primary level for typically learning children and children with visual or hearing impairments.

Cognitive, Intellectual Disabilities

The way a child learns is influenced, by how different sense organs, parts of our bodies and the brain are coordinating or how they are affected. Specific disabilities, such as Autism Spectrum, intellectual impairments and learning difficulties are primarily associated with the working of the brain and/or how the brain processes the information received. These are addressed under cognitive and intellectual disabilities.

Given the increasing use and, at times misuse, of many of these terms, a little clarification and some overview of cognitive and intellectual disabilities would be helpful for our work in the inclusive classrooms. The following paragraphs offer a brief understanding about these conditions and disabilities. To facilitate the understanding of the information presented in the handbook and to help advance your own learning, we also explain how the terms cognitive and intellectual disabilities are used in the handbook .

Among the conditions that arise due to the manner in which the brain works and that have direct implications for teaching-learning, Specific Learning Disabilities/Difficulties (SLD) and Autism have received significant attention in recent times. Of these, we hear the term SLD being used very often. It is important that we have a clearer understanding of what these terms mean because that has direct implications for our work with the students in the classrooms. We must understand that a child's evaluation and assessment need to meet certain expected criteria for her/him to be identified as experiencing these conditions, and to receive related and required educational interventions and services.

Difficulties and disorders such as SLD, Autism, (and also retardations in learning) require detailed examinations, tests and diagnosis, which may not be available or accessible to the children that attend our schools for their learning and education, and their families. It is, therefore, important to be careful before labelling or wrongly diagnosing a child with a disability. Mislabelling or identifying incorrectly would result in a child's needs not being understood. In many of our settings, not being able to understand how the child makes sense of the world and learns, often results in the student being discriminated against. These misunderstandings can prevent the students in our schools from getting the educational interventions that would otherwise help them to begin learning in the classrooms.

Disabilities which teachers often talk about today, such as SLD, Autism, are therefore all the more challenging to understand in our context.

First, because they require adequate research based and field tested evaluations by trained professionals; second and more important, these evaluation procedures need to be relevant to and address diverse contexts; and third, because a more definitive understanding about these conditions and how the brain functions continues to evolve even in contexts where research and understanding about these conditions are comparatively more advanced.

The following paragraphs provide basic information about specific cognitive and intellectual impairments.

Autism

"...typically appearing in the first three years of life that significantly affects a person's ability to communicate, understand relationships and relate to others, and is frequently associated with unusual or stereotypical rituals or behaviours."

Alternative term: Autism Spectrum Disorders (ASD). ASD is a developmental disorder. It refers to a range of serious developmental, neurological problems. Autistic disorder, autism or classical ASD, is the most severe form of ASD. It appears in early ages, usually before a child reaches 3 years of age and affects the regular development of social and communications skills.

The Draft Rights of Persons with Disabilities Bill, 2012 [8], defines "Autism Spectrum Disorder" as a "neuro-developmental[9] condition typically appearing in the first three years of life that significantly affects a person's ability to communicate, understand relationships and relate to others, and is frequently associated with unusual or stereotypical rituals or behaviours" (p. 84). Needs vary from child to child, but all disorders in the Autism Spectrum severely affect a child's ability to communicate and interact with others.

Such children exhibit social impairments, communication difficulties, and repetitive, stereotyped patterns of behaviour. Studies and investigations to better understand this developmental problem continue. To date there is no known cure but certain interventions can help a child adapt and thus make a difference in the living and learning experiences.

8 GOI (2012). *Draft Rights of Persons with Disabilities Bill. Ministry of Law, Justice and Company Affairs, New Delhi. Retrieved from http://socialjustice.nic.in/pwd2011.php*

9 *In the Draft Bill the term earlier used was neuro-psychological which has recently been replaced by the term neuro-developmental.*

Specific Learning Disabilities/Difficulties

It is a general term used to describe specific kinds of learning problems. A learning disability/difficulty affects the ability to learn and use certain skills. The skills typically affected are reading, writing, listening, speaking, reasoning, directing attention, doing mathematical calculations and coordinating movements. Dyslexia or difficulties experienced in reading, Dyscalculia or difficulties with mathematics, and Dysgraphia or difficulties with writing are also terms used when addressing disabilities that affect specific aspects of learning.

"It is especially important to know that a child with SLD is not lazy or dull, but that she or he is not able to learn because of the way her/his brain is recording and analysing information."

It is especially important to know that a child with SLD is not lazy or dull, but that she or he is not able to learn because of the way her/his brain is recording and analysing information. It is therefore important to first rule out any environmental issues that may be impacting the student's learning such as too many distractions, poor visibility/lighting, health issues, fatigue, nutrition deficiencies etc.

As with autism, determining a child as having SLD also needs detailed and specific assessments and evaluation to understand the nature and severity of the disability. One child with SLD may experience the world in a different way compared to another child with SLD, and will thus have different types of learning problems and needs. One child with SLD may therefore experience difficulties in writing, and another child may experience difficulty only in mathematics.

Intellectual Disabilities

The term refers to lowered capacity or ability of the brain, commonly referred to earlier as mental retardation. There has been a shift away from using the term retardation. In a poll conducted in 2003, the term "retard" was voted to be the most offensive word (Rose, 2004). In keeping with the shift towards using a more positive terminology, this handbook also uses the term intellectual disabilities in discussing impediments to learning experienced in the classroom due to lowered capacity and/or ability of the brain's functioning. Intellectual disabilities that affect learning and overall development are experienced when functioning of the brain is so affected that the child shows limitations in daily living skills like communicating, taking care of self and social skills. These limitations will cause a child to learn and develop more slowly than a typically developing child and catch up at a slower rate on many skills that their regular same-age peers have

attained, for example, dressing self, speaking, walking etc. They do catch up or learn, but it takes them longer than the regular, typically growing and developing child (hence the previously widely used term retardation meaning slowness. Due to negative connotations attached to this term it is not used as widely as before).

Physical Disabilities

Physical disabilities arise when a child is unable to participate due to impairment of the physical organs affecting mobility, movement, and/or dexterity. The Draft Rights of Persons with Disabilities Bill, 2012, in clarifying the benchmark disabilities, locates cerebral palsy as a condition related to physical disability (p. 4). This handbook presents some tips, suggestions and ideas for including students with orthopaedic or physical disability.

The implementation of RTE requires that every classroom be ready to include a Child with Special Needs (CWSN) in its teaching learning processes, assessment and evaluation procedures and extra-curricular activities. This handbook has been prepared with these expectations in mind. Explanation of how its contents are organised is given below.

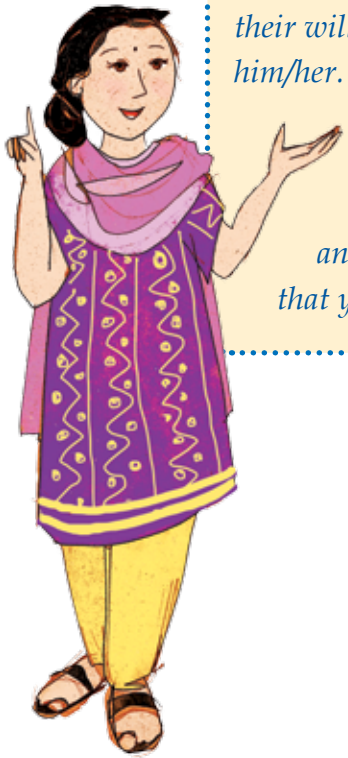
The Sections of the book would be as follows.

<table>
<tr><td colspan="3">SECTION I</td></tr>
<tr><td>STUDENTS LEARNING NEEDS
IN DIFFERENT SUBJECT AREAS</td><td>TIPS AND STRATEGIES FOR ADAPTING
LANGUAGES,
SOCIAL SCIENCES,
MATHEMATICS,
SCIENCE</td><td>EXEMPLARS FROM TEXT BOOKS</td></tr>
<tr><td colspan="3">SECTION 2</td></tr>
<tr><td colspan="3">CONTINUOUS AND
COMPREHENSIVE EVALUATION</td></tr>
</table>

Classrooms today are not the same as they were a few years ago. With the RTE 2009, the composition of classrooms has changed. Students with varying levels of abilities are now a part of these classrooms and we cannot, and should not, teach all of them in the same manner. We must also recognise that a child with disability is a child first, and the disability, which affects some but rarely all aspects of his/her behaviour, comes only next. A disability condition is never a total condition, except when the condition is very severe as in the case of multiple disabilities where both mental and physical disabilities are combined. A child with disability may not be able to see but may have no difficulty in moving and listening. A child who cannot hear may write good stories and a child with intellectual disability may play good cricket.

"We must also recognise that a child with disability is a child first, and the disability, which affects some but rarely all aspects of his/her behaviour, comes only next."

No specific disability implies specific problems since there are wide variations in the degree to which persons learn to cope with the same degree of disability. Disability is always to be seen in the context of society. From the moment a child with disability is born, society is the force that shapes the child's life. S/he is affected by other people's behaviour, their willingness to support him/her or segregate/reject him/her. As a teacher it is your duty to create a welcoming, supportive environment in the classroom. The decision that would have the most significant effect on the child is whether s/he is included or excluded and this, in turn, will depend upon the expectations that you have from him/her.



Notes

Creating Effective Inclusive Upper Primary Classrooms

One must be considerate about the individual's impairment but it cannot be an excuse for poor or unacceptable performance.

In the earlier section we talked briefly about different subject areas at the upper primary level and the disabilities around which this handbook has been organised. In this section we discuss the curricular expectations in different domains of study, giving tips and strategies for inclusive classrooms that have students with specific needs related to sensory, cognitive/intellectual and physical disabilities.

CURRICULAR AREAS

Languages

Language education is not confined to the language classroom (NCF, 2005, pp 38). Every class is, at first, a language class and then a subject class, as language cuts across the curriculum. The basic objective of language teaching is to develop language proficiency among the children which comprises comprehension and articulation or expression. Listening and reading help in developing comprehension skills. Speaking and writing help in developing expression abilities[10]. Following are the objectives of language learning:

Objectives of Language Learning from Class VI to VIII

- To enable children to articulate individual or personal responses effectively.
- To help them use language and vocabulary appropriately in different contexts and social encounters.
- To help them organize and structure thoughts in writing/speech.
- To help them understand, enjoy and appreciate a wide range of texts representing different cultures, ways of living.
- To help them understand and enjoy jokes, anecdotes and riddles.
- To use his/her proficiency in language to explore and study other areas of knowledge through print and non-print media (like skits, children's films, discussions, children's story books, comics and magazines etc.).
- To use his/her critical/thinking faculty to read between the lines and to go beyond the text.
- To understand the central idea and locate details in the text (prescribed and non- prescribed).
- To write simple messages, invitations, short paragraphs, letters (formal and informal), applications, simple narrative and descriptive pieces etc[11].

10 *NCERT Continuous and Comprehensive Evaluation (CCE): English: Upper Primary Stage, (http://www.ncert.nic.in/departments/nie/dee/publication/pdf/CCE_English.pdf)*

11 *NCERT (2005). National Curriculum Framework (NCF). New Delhi.*

Social Sciences

At the upper primary stage, Social Sciences draw content from History, Geography, Political Science and Economics. The curricular expectations at this stage are given below:

Curricular Expectations

At the end of the Upper Primary Stage —

- the child should be able to view contemporary issues from multiple perspectives, introducing the child to social and economic problems of society like poverty, illiteracy, child and bonded labour, class, caste, gender, environment etc.;
- develop a proper perspective related to environmental issues and development at different levels from local to global;
- acquire a general idea of development in different periods of history;
- understand the formation and functioning of governments at the local, state and central levels, and the democratic processes of participation;
- view the perspectives of women as being integral to the discussion of any historical event and contemporary concern; and
- develop the ability to think independently and deal with the social forces that threaten human values, without losing her/his individuality.

Mathematics

Mathematics is a compulsory subject of study (at least till class VIII for children with visual impairments) and teaching access to quality mathematics education is every child's right[12]. CWSN learn Mathematics like any other child, and their needs (in terms of pedagogy, learning material etc.) have to be addressed by teachers.

At the upper primary stage, students get the first exposure to application of abstract concepts that build upon previous learning and experience. Students are introduced to algebraic notation and its use in solving problems, and the systematic study of space and shapes in general. This also helps in consolidating the knowledge of measurement. Learning at this

12 *NCERT (2006). Position Paper : National Focus Group Paper on Teaching of Mathematics (http://www.ncert.nic.in/new_ncert/ncert/rightside/links/pdf/focus_group/math.pdf)*

stage also offers an opportunity to enrich the students' spatial reasoning and visualisation skills. (NCF, 2005, p.45). Given below are the curricular expectations in the learning of Mathematics from classes VI to VIII.

Curricular Expectations[13]

During the upper primary stage, a child —

- moves from number sense to number patterns;
- sees relationships between numbers and looks for patterns in relationships;
- gains proficiency in using newer language of Mathematics like variables, expressions, equations, identities etc.;
- uses arithmetic and algebra to solve real life problems and pose meaning problems;
- discovers symmetries and acquire sense of aesthetics by looking around regular shapes like triangles, circles, quadrilaterals etc.;
- comprehends the idea of space as reason enclosed within boundaries of a shape;
- relates numbers with shapes in terms of perimeter, area and volume, and uses them to solve everyday life problems;
- learns to provide reasoning and convincing arguments to justify her/his own conclusions, particularly in Mathematics; and,
- collects, represents (graphically and in tables) and interprets data/information from her/his life experiences.

Science

During the upper primary stage of learning, we can expect the beginning of quantitative understanding of the world in children[14]. The child at this stage is engaged in learning the principles of science through familiar experiences, working with hands to design simple technological units and modules (for example, designing and making a working model of a windmill to lift weights) and continuing to learn more about the environment and health including reproductive and sexual health, through activities and

13 *NCERT (2014). Learning Indicators and Learning Outcomes at the Elementary Stage (http://www.ncert.nic.in/departments/nie/dee/publication/pdf/LI_Final_Copy_Revised_29.12.14.pdf)*

14 *NCERT (2006). Syllabus for Classes at the Elementary Level. New Delhi.*

surveys. Scientific concepts are to be arrived at mainly from activities and experiments. The curricular expectations at this stage of learning are given below.

Curricular Expectations

Science syllabus at the upper primary stage identifies age appropriate content to be utilised as a vehicle to develop scientific temper and scientific thinking by —

- developing process skills of science; (process skills include making observations, posing questions, looking for various resources of learning in search of questions, planning investigations, making and testing hypothesis, using various tools for collection, analysis and interpretation of data, communicating explanations with evidences, justifying explanations, critical thinking to consider and evaluate alternative explanations, reflecting on their thinking by comparing what they think with what the scientific community thinks, and engaging in sustained discussions.)
- making generalisations, proving or disproving hypothesis, developing explanations, communicating and applying concepts;
- imbibing the development of historical perspectives, environmental concerns and sensitivity; and,
- developing respect for human dignity and rights, gender equity, values of honesty, integrity, cooperation and concern for life.

Given above are the curricular objectives for various subjects at the upper primary stage. Children with disabilities should also enjoy equal opportunities to achieve the same objectives as their peers. However, the intention of the teacher must not be to drive students through these outcomes as quickly as possible. These outcomes should not limit the freedom of flexibility and scope for the teachers. They can carry out modifications and adaptations, and provide individualised and varying programmes of learning so that a child is secure at a level before moving on to the next.

In the section below we highlight some learning needs of children and curricular adaptations or/and modifications in different subject areas.

"...the intention of the teacher must not be to drive students through the outcomes as quickly as possible. These outcomes should not limit the freedom of flexibility and scope for the teachers. They can carry out modifications/ adaptations, and provide individualized and varying programmes of learning so that a child is secure at a level before moving on to the next."

Sensory Disabilities: Visual Impairments (VI)

Vision is more precise than audition, both in terms of accuracy of localisation (distance and direction information) and identification of objects (features that tell us what something is). These advantages of vision for spatial perception have often led theorists to assume that blind and visually impaired people must necessarily be deficient in spatial abilities.

– Simon Ungar (2000)

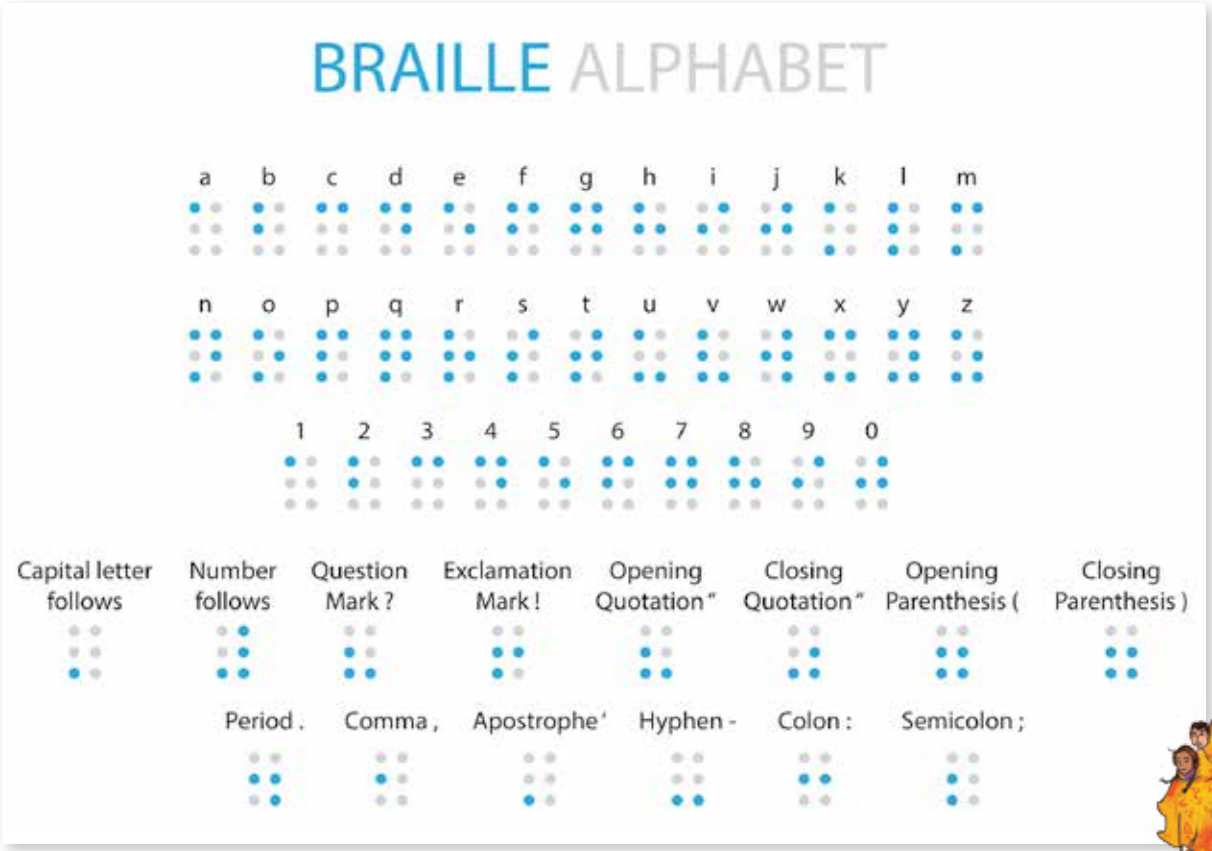
Like all other children, children with VI also differ from each other on a number of factors. Some of the factors on which these children differ are - age of onset of VI (by birth or later in life), degree of vision (low vision or blind) and type of loss (progressive or non-progressive). Many children may have VI as their only disability, while there may be a few having additional sensory, cognitive and/or physical challenges.

Students with VI who do not also have cognitive disabilities can master the regular curriculum. In addition, they need to develop skills for reading and writing (Braille) and to make use of adapted equipment and assistive technology. In their case, it is not so much as to what these children learn but how they learn that matters.

Some of the common areas that need to be addressed are given here.

AREAS

- visual stimulation;
- experiential learning (observational/experimental/factual learning);
- incidental learning (learning that happens naturally in the environment);
- understanding of concepts like laterality (localisation), time, position, size, shape, association, discrimination, sequence, quantity, sensations, emotions, actions, colours (to the best visual ability), matching, and classifying[15];
- understanding of abstract concepts;
- visual perception – learning from pictures, visual diagrams-maps, charts, graphs, tables etc.; and,
- slower cognitive processing in the earlier years till coordination of senses has developed.



15 *Virginia Department of Education Office of Special Education and Student Services. (2010). Guidelines for Working With Students Who Are Blind or Visually Impaired In Virginia Public Schools.*

LANGUAGE

Specific Needs related to Language

- Long passages and learning from visualised inputs; and,
- Taking more time in interpreting meaning as reading in Braille requires more time and involves great amount of memorising and synthesising since wholeness of phrases, sentences etc. is not possible.

Tips and Strategies for Inclusion of Children with VI in Language Teaching and Learning

- Format (for writing letters, applications etc.) can be verbally introduced by the teacher.
- Students should be encouraged to do model reading[16]. More interactions in the classroom with the help of the teacher would improve conversation skills.
- New vocabulary introduced should be transcribed in Braille with meanings.
- Practise oral expressive language using day to day activities.
- Describe words like minute, huge, far away, sea, small organisms and insects etc. verbally with detailed information.
- Frame questions and encourage children to answer them, and ask children to also frame questions and find answers on their own.
- Use tapes and storytelling for enhancing pronunciation. Different sounds through audio recordings, such as water fall, wind, waves, thunder, sounds of animals and transport can be used to explain various concepts.
- Encourage all the students in the class to interact with each other.
- Use acting, dramatisation and role play.

16 *This means reading aloud which also facilitates thinking aloud and discussions.*

Social Science

Specific Needs related to Social Sciences

- Verbal content including geographical terms and concepts, for example, latitude, longitudes, directions etc.;
- Graphic and visual descriptions like map reading, graphs, diagrams, paintings, inscriptions, symbols and monumental architecture etc.;
- Making observations of environment and space – land, climate, vegetation and wildlife, distribution of resources and services; and,
- Reference material like spelling lists, study questions, important references, and other information students may need to refer can be provided in enlarged, tactile or embossed formats or redrawn with proper contrasts.

Tips and Strategies for Inclusion of Children with VI in Social Science Teaching and Learning

- Use detailed verbal descriptions of graphical representations and pictures like maps. These can be also made tactile with proper contrasts (See Page 32).
- Use models, block paintings[17].
- Use examples from everyday life for explaining various facts/concepts.
- Use audio visual materials like films and videos to explain abstract concepts; for example, discrimination, stereotyping etc.
- Develop embossed[18] time line for memorising; for example, different historical periods.
- Organise group work involving debates, quizzes, map reading activities etc.
- Organise excursions, trips and visits for the students to historical places (educational tour).
- Involve students in exploring the environment using other senses like smell and touch.

17 Models and block paintings can be tactually explored by these children, first as a whole and then different parts can be also explained. Models can be made using different materials like clay, wood, plaster of paris etc.

18 Gluing, strings, cloth, other materials can be used for making pictures tactile. Embossed pictures that are complex are difficult to perceive optically and may take a lot of time. Also, getting three-dimensional (depth) information from these is not possible.

Mathematics

Specific Needs related to Mathematics

- Development of spatial concepts (concepts related to space) and understanding the relationships between spatial concepts;
- Understanding three-dimensional objects transformed into two-dimensional forms[19];
- Understanding special characters (symbols) used in Mathematics;
- Difficulty in audio recording of mathematical text, for example, equations etc.;
- Difficulty in transcribing and reading mathematical text in Braille because of spatial arrangement and colour codes;
- Learning of Nemeth or any other Mathematical Braille Code[20].

Tips and Strategies for Inclusion of Children with VI in Mathematics Teaching and Learning

- Use adapted and other educational aids[21] for supplementing portions of textbook (graphic representations, geometrical shapes, measuring and computing etc.) and for interpreting mathematical concepts.
- Use concrete objects[22] (like strips of folded paper for teaching fractions, toys, 2D cutouts, 3D models of shapes of cardboard etc.) and activities for understanding mathematical concepts.
- Provide tables, for example, for square, square roots, cube or cube roots in Braille.
- Encourage oral mathematics for computing.
- Use worksheets with practice problems.
- Shorten assignments (if required, for example, by giving representative sample of all the home work problems).
- Make use of different senses for teaching mathematical concepts, for example, auditory(verbal descriptions) and tactual (converting visual figures into embossed tactile figures).

19 A child with VI cannot understand a geometrical figure of a cube or cylinder, for example, from a 3 -D perspective view because of his/her lack of visual experiences. S/he also has difficulties in enlarging and minimising two dimensional forms.

20 Braille Mathematical Code (http://www.deficienciavisual.pt/txt-Teaching_Math_to_VI_students.htm)

21 Blocks, wire figures, geometrical kit, braille protractor, geo tactile board, ruler, balance scales, thermometer, (adapted form-talking digital) braillers Taylor frame, calculators, abacus, enlarged visual displays, tactile graph sheets etc.

22 For shapes use brooms stick (jharu ki teeli), used match sticks, dough (flour)/glue for connecting, used card paper from note books, boxes, ice cream sticks, seeds (imli), grains, bangles, marbles, pebbles, different textured cloths, paper and thread.

Science

Specific Needs related to Science

- Abstract and difficult concepts
- Experiments, especially in Chemistry
- Requirement of more time
- Understanding Visual Inputs like chalkboard, demonstrations, presentations graphics and diagrams etc.

Tips and Strategies for Inclusion of Children with VI in Science Teaching and Learning

- Use multisensory approach for integrating information from auditory, olfactory (smell), tactile as well as visual sources.
- Provide learning experiences through touching objects[23], materials, organisms, models etc. to experience size, shape, texture, pattern and changes.
- Use raised line diagrams for explaining texts, pictures, graphs and flow charts etc.
- Use direct sensory experiences for developing concepts like temperature, volume etc.
- Sequence experiences and components as this helps in concept development.
- Provide opportunities to look at and experience the apparatus and materials before introducing an experiment as children with VI are not familiar with these. Some science equipment is available with tactile markings like beaker, scale, measuring test tube etc.
- Give opportunities to work with a peer during experiments. Rotating partners for the entire class would be a good strategy.
- Give verbal descriptions for understanding diagrams, photographs, demonstrations, and visual experimental outcomes like change of colour and bubbles.
- Provide high contrast printed material in appropriate fonts.
- Label all coloured objects used/ related to lessons, experiments, with large fonts, Braille or tacitly code these for students with VI.
- Allow students to record classroom presentations and lectures or the text in audio formats[24].

23 *Do not use very small objects. Instead use larger objects, like even while using seeds use seeds such as beans, peas etc.*

24 *Source: http://www.as.wvu.edu/~scidis/vision.html#sect2.*

Use detailed verbal descriptions of graphical representations and pictures like maps. These can be also made tactile with proper contrasts.

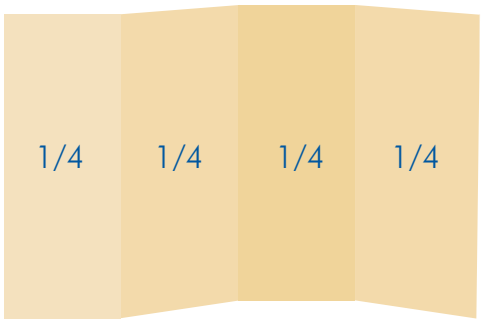
Some Examples

English

- **Listening skills** can be developed by the teacher by speaking more in the initial stages of a lesson. Tapes can also be used to enhance pronunciation. Children can be encouraged to share their experiences. Story telling sessions can be held. Students with vision can explain concepts using vivid imagination and that will enrich their VI peers' learning.
- **Grammar:** To make the child understand grammar – sentence editing, omission in phrases and jumbled sentences – short sentence structure can be used so that the child is able to recollect the concept easily.
- **Long passages:** Paired reading can be encouraged for long passages. Children with VI find it difficult to go through the passage all over again and find antonyms, synonyms or adjectives. More practice in spellings and additional time may be required.
- **Letter Writing:** The correct format of letter, notice etc. is not clear to VI students. They need to be informed about spatial arrangement like left or right corner for writing the address etc. Children with low vision would need enlarged formats.

Mathematics

- Child can learn about figures and shapes by using strategies like associating, matching, discriminating and generalising with different shapes in their environment. For example, a bangle or *chapati* for circle, a tetra-pack or ice cream cone for pyramid, match box, duster or compass box for the concept of cubiod etc.



- Concepts of line segment, angles, fractions etc., can be taught through paper folding activities. For example, for teaching fractions, strips of paper can be folded (this will help them understand what the whole is) in different numbers of equal parts like half, third, fourth etc. along with written names. Containers like cardboard shoe box etc. can be used to cut-out the fractional parts for learning the concept of

fractions. Edges can be smoothened out. Examples of other activities are using body parts (concept of half by counting one out of two on fingers), physical jumps (count every third jump), blocks etc.

- Parallelogram can be taught in the following way:
  Tie rubber band in a rectangular shape using pegs on the Taylor frame.

Shift lower line segment in either direction (left or right) equally.

left shift left shift

Social Sciences

A VI child can feel different sizes and texture of rocks like sand, slate, clay. For example, actual visits to understand the differences in texture of sedimentary and metamorphic rocks can be undertaken.

- For the concept of motions of earth, involve all the students in an activity related to rotation and revolution, and tell them about rotation by rotating one student in the centre and for revolution, moving one student around another student.

Science

- In the science laboratory, the child can feel the equipment like test tubes, conical flask, tripod stand, spirit lamp, slides, cover slips etc. by touching.

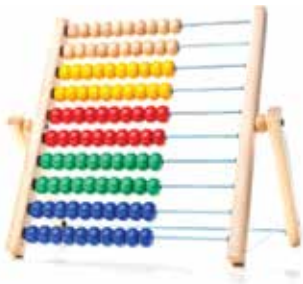
- Concepts like magnetism and electricity can be taught through vertical sequencing[25]. For example, the child is introduced to the concept of magnetism and electricity. This is followed by the students experiencing basic concepts of electricity: open and closed circuit, conductors, insulators etc. The third activity builds on the earlier activities and introduces the concept of electromagnetism (Huebner, K.M., Licchi, L.D., Malone, L., Myrna, R.O. 1981).
- Concepts of temperature, distance, volume and weight etc. can be learnt through direct sensory experiences. For example, touching water at different temperatures.
- In Chemistry, changes can be sensed through sounds, smells, touch etc.
- Direct experiences and models can be given to the child, like showing different types of roots, for example, fibrous or tap roots, flowers, body parts.

Assistive Devices

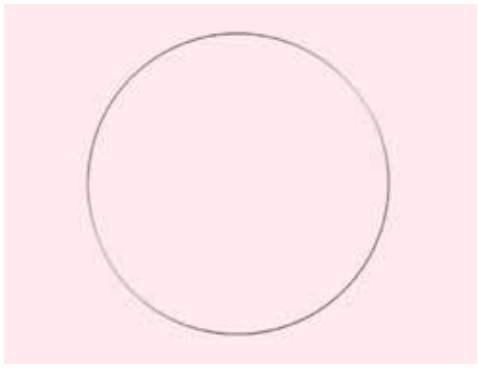
Beside Braille books, talking books, e-books and daisy books, some other aids and kits are:

- Taylor frame
- Abacus
- Talking calculator
- Geo – board
- Geometry kit
- Tactile board
- Geometric shape board (for circle, graph, representation)
- Tactile graph sheet (for bar-graph, histograph etc)
- Tactile raised diagram
- 3D blocks and figures

Printing block showing a book cover published by McDougalls Educational Company. (http://www.edinburghcity ofprint.org)



25 *Building the higher concept by putting series of activities together, each activity being a prerequisite to the next, and building a concept at each level.*



A general teacher can also teach through geo-board using the stylus/spur wheel to make the paper tactual.

- Talking watches and talking clocks
- Use of ICT (Computer, screen readers, voice synthesis, scanners, multimedia gadgets like CD, MP3 etc.).

Facilitating Participation of Children with VI in Inclusive Classrooms

- Make books available in Braille and large font, electronic text, audio formats.
- Provide verbal descriptions of visual materials.
- Make use of tactile material and models, real life objects in the classroom.
- Provide assistive devices like Braille slate and stylus, Taylor frame, Abacus, tactile geometric kit, specialized software for computers, low vision aids etc.
- Collaborate with other teachers.
- Give additional time and shorter assignments, if required.
- Facilitate group work. Sighted students can explain more vividly and their visually impaired peers will relate more with their accounts.
- Provide carbon or xerox copy of notes that can be read to the VI child by a peer/sibling/family member etc.
- Organise classrooms by removing dangerous obstacles and objects (like nail in desk etc.), familiarising the child with the classroom, placing materials in same place so that students know where the items are located, eliminating unnecessary noise, providing good lighting and sitting arrangements (preferably in front near the chalkboard).

Adapting a Sample Chapter

Subject: English, Class – VI (Honeysuckle)

Sample pages from Chapter 10 "The Banyan Tree" with Suggestions:

10

Before you read

- *Have you seen a mongoose? You have read in Lesson 9 that a mongoose can fight with and kill a snake. Look at the pictures and read the lines given along with them.*

The Banyan Tree

The fight of the cobra and the mongoose is a classic drama often seen in India, and the outcome is largely the same. The mongoose is not immune to the venomous bite, but is faster and quicker in motion than the snake. The cobra assumes a posture of defence and attempts to reach the animal by a sweeping strike, but the quick-moving mongoose jumps out of reach and comes at the snake from another

direction, before the snake can get into striking position again. This constant movement tires and discourages the snake, and the mongoose is finally able to leap in close and bury its teeth in the snake's neck, usually severing the

Cobra, Mangoose

Describe animals through use of models (stuffed animals) – such as, a model of cobra wrapped in silk cloth to give the cherry like appearance with smooth and slippery kind of texture.

The fight of Cobra and Mongoose

Snake fighting posture can be shown by arched arms. The teacher can ask all children to do this activity and the child with VI can touch his/her peer.

37

Banyan Tree

Verbal descriptions explaining the salient features of the tree such as, it is magnificent, old, big, and comparisons can be made with other trees.

Squirrels, Snails and Butterflies

Models can be used to explain the differences and animals can be described.

THE BANYAN TREE 125

- *You must have seen a banyan tree. This is a story about what the author saw, as a young boy, when he was sitting in an old banyan tree in his grandfather's house.*

Part I

1. THOUGH the house and grounds belonged to my grandparents, the magnificent old banyan tree was mine — chiefly because Grandfather, at sixty-five, could no longer climb it.
2. Its spreading branches, which hung to the ground and took root again, forming a number of twisting passages, gave me endless pleasure. Among them were squirrels and snails and butterflies. The tree was older than the house, older than Grandfather, as old as Dehra Dun itself. I could hide myself in its branches, behind thick green leaves, and spy on the world below.
3. My first friend was a small grey squirrel. Arching his back and sniffing into the air, he seemed at first to re[sent] my invasion of his privacy. But wh[en] he found that I did not arm myself w[ith] catapult or air gun, he became frien[dly], and when I started bringing him pie[ces] of cake and biscuit he grew quite b[old] and was soon taking morsels from ha[nd]. Before long, he was delving into [my] pockets and helping himself to whate[ver] he could find. He was a very you[ng] squirrel, and his friends and relati[ves]

spy: watch secretly

resent: dislike; feel angry about

morsels: small pieces of food

delving: going deep into

Colour Grey

Word 'Grey' can be explained with examples of objects that are grey.

probably thought him foolish and headstrong for trusting a human.

4. In the spring, when the banyan tree was full of small red figs, birds of all kinds would flock into its branches: the red-bottomed bulbul, cheerful and greedy; parrots, myna and crows squabbling with one another. During the fig season, the banyan tree was the noisiest place in the garden.

5. Halfway up the tree I had built a crude platform where I would spend the afternoons when it was not too hot. I could read there propping myself up against the tree with a cushion from the living room. *Treasure Island*, *Huckleberry Finn* and *The Story of Dr Dolittle* were

during the fig season: the time when figs appeared

propping myself up: leaning against

Proper description of the features of the picture should include the development and the flow of the story and the messages in it.

THE BANYAN TREE 127

some of the books that made up my banyan tree library.

6. When I did not feel like reading, I could look down through the leaves at the world below. And on one particular afternoon I had a grandstand view of that classic of the Indian wilds, a fight between a mongoose and a cobra.

Part II

7. The warm breezes of approaching summer had sent everyone, including the gardener, into the house. I was feeling drowsy myself, wondering if I should go to the pond and have a swim with Ramu and the buffaloes, when I saw a huge black cobra gliding out of a clump of cactus. At the same time a mongoose emerged from the bushes and went straight for the cobra.

8. In a clearing beneath the banyan tree, in bright sunshine, they came face to face. The cobra knew only too well that the grey mongoose, three feet long, was a superb fighter, clever and aggressive. But the cobra, too, was a skilful and experienced fighter. He could move swiftly and strike with the speed of light; and the sacs behind his long sharp fangs were full of deadly poison. It was to be a battle of champions.

grandstand view: a clear view from the best position (a grandstand is a large covered space with rows of seats for people to watch sports)

gliding: moving smoothly

clump: group (of bushes or trees)

emerged: came out

clearing: an open space in a forest where there are no trees

sacs: a part (of an animal or plant) shaped like a bag

fangs: long sharp teeth (of a snake or dog)

Objects like Cactus/bushes etc.

Description can be given along with concrete experiences like touching the bush or the hard bristles of a brush etc.

Movement

Give examples of swift movement and striking with speed of light in different contexts.

128 HONEYSUCKLE

9. Hissing [illegible] darting in and out, the cobra raised three of his six feet off the ground, and spread his broad, spectacled hood. The mongoose bushed his tail. The long hair on his spine stood up.

10. Though the combatants were unaware of my presence in the tree, they were soon made aware of the arrival of two other spectators. One was a myna, the other a jungle crow. They had seen these preparations for battle, and had settled on the cactus to watch the outcome. Had they been content only to watch, all would have been well with both of them.

defiance: rebellion; [illegible] suddenly

combatants: participants in a fight

spectators: those who watch a show, a game, etc.

outcome: result

Words like hissing, thudding, shrill cry can be illustrated through different sounds.

130 HONEYSUCKLE

15. The third round followed the same course as the first but with one dramatic difference. The crow and the myna, still determined to take part in the proceedings, dived at the cobra; but this time they missed each other as well as their mark. The myna flew on and reached its perch, but the crow tried to pull up in mid-air and turn back. In the second that it took the bird to do this the cobra **whipped** his head back and struck with great force, his **snout** **thudding** against the crow's body.

16. I saw the bird ...ng nearly twenty feet across the garden ...t fluttered about for a while, then la... still. The myna remained on the ca...us plant, and when

round: here, a stage in a fight or competition

pull up: here, stop

whipped...back: moved...back suddenly

snout: the nose and mouth of an animal

Words like whipped that have dual meaning should be explained properly with examples.

Adapting a Sample Chapter

Subject: Social Science, Class – VII (Our Enviornment)

Sample pages from Chapter 5 "Water" with Suggestions:

5 Water

Glossary

Terrarium: It is an artificial enclosure for keeping small house plants.

Activity

Make your own Terrarium

A Terrarium

Fill one-fourth of a big jar with soil and press it well. Put a thin layer of humus on top of it. Plant the largest plants first and then arrange the smaller ones around them. Spray the arrangement with water and close the jar. The water that evaporates from the

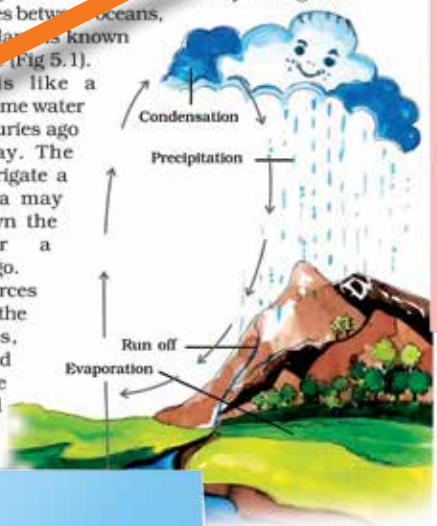
When you think of water, what images come to your mind? You think of rivers, the waterfalls, the pitter patter of raindrops, water in your taps... Children love to float paper boats in rain puddles. By noon the puddles vanish. Where does the water go?

The sun's heat causes evapo... of water ...our. When the water vapou... down, it co...ses and forms clouds. ...here it may fall o... land or sea in th... of rain, snow or sleet.

The process by which wa... continually changes its form and circulates betw... oceans, atmosphere and la... known as the wat... (Fig 5.1).

Our ...h is like a terrarium. The same water that existed centuries ago still exists today. The water used to irrigate a field in Haryana may have flowed down the Amazon River a hundred years ago.

The major sources of fresh water are the rivers, ponds, springs and glaciers. The ocean bodies and the seas contain salty water. The



Water Cycle

A Terrarium

Making a Terrarium can be a group activity. The changes seen in the plants can be explained by the peers and the child can easily participate in the discussions regarding Terrarium. Children can experience the whole activity through touching the plants, flowers, buds and leaves, assessing size, length, and thickness etc. Child can also smell the plant/soil.

Water Cycle

This needs to be explained in detail with verbal descriptions. Concrete activities are useful for all children. Hot water in a thermos/cup can be used to explain water vapour. A child with VI can feel the steam coming out from a thermos/cup with his/her hand. Diagram of water cycle can be enlarged with proper contrast for children with low vision.

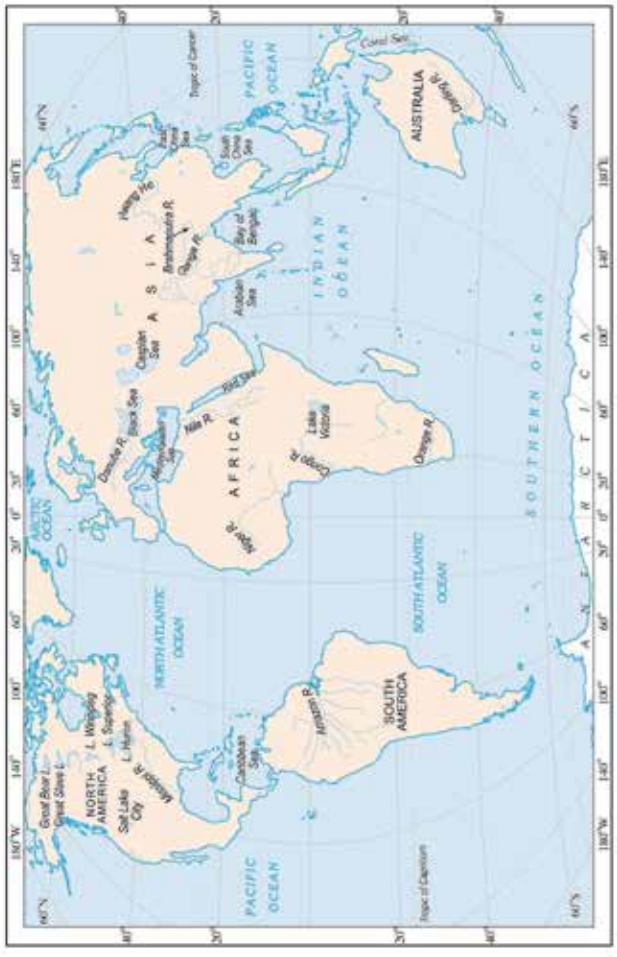


Fig. 5.2: World - Major Seas, Lakes and Rivers

amount of dissolved salts. Most of the salt is sodium chloride or the common table salt that you eat.

Map – Major Seas, Lakes and Rivers

Prepare tactual map using 3D glue.
Verbal descriptions have to be given.
The content, if covered in earlier classes, can be revised again.

- Why is water important for us?
- Suggest some ways in which water can be conserved (a) in your home (b) in your school

Distribution of Water bodies.

Newspaper cuttings and articles on need for conservation of water can be collected by students and discussed in class.

Ocean Circulation

There is something magical about walking bare feet on the seashore. The wet sand on the beach, the cool breeze, the seabirds, the smell of the salt in the air and music of the waves; everything is so fascinating. Unlike the calm waters of ponds and lakes, ocean water keeps moving continuously. It is never still. The movements that occur in oceans can be broadly categorised as: waves, tides and currents.

Do you know?

March 22 is celebrated as World Water Day when the need to conserve water is reinforced in different ways.

Fig. 5.3: Pacific Ocean

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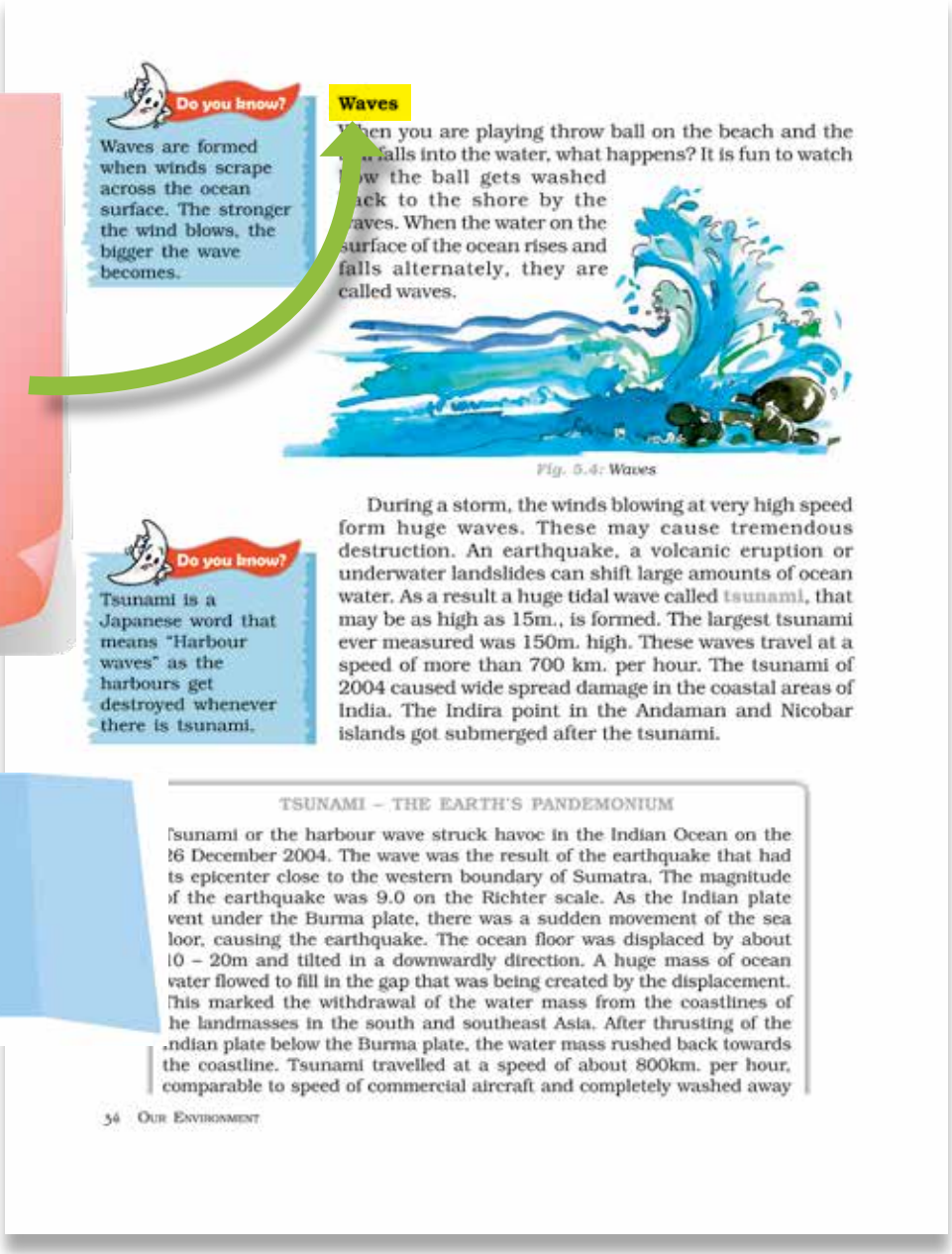
Seashore

If you are in a place near the sea or a river, children can be taken for a field trip to experience the sea through sounds of waves, smells of the sea shore and touching the water and feeling tides. In case, this visit is not possible, sound of waves and simulated experience with other bodies of water or bucket of water emptied with force can be given.

Waves

Concept of waves can be explained through touching hands moving like waves. Also paper can be folded like waves and felt through touch, along with verbal description.



Do you know?

Waves are formed when winds scrape across the ocean surface. The stronger the wind blows, the bigger the wave becomes.

Waves

When you are playing throw ball on the beach and the ball falls into the water, what happens? It is fun to watch how the ball gets washed back to the shore by the waves. When the water on the surface of the ocean rises and falls alternately, they are called waves.

Fig. 5.4: Waves

Do you know?

Tsunami is a Japanese word that means "Harbour waves" as the harbours get destroyed whenever there is tsunami.

During a storm, the winds blowing at very high speed form huge waves. These may cause tremendous destruction. An earthquake, a volcanic eruption or underwater landslides can shift large amounts of ocean water. As a result a huge tidal wave called tsunami, that may be as high as 15m., is formed. The largest tsunami ever measured was 150m. high. These waves travel at a speed of more than 700 km. per hour. The tsunami of 2004 caused wide spread damage in the coastal areas of India. The Indira point in the Andaman and Nicobar islands got submerged after the tsunami.

TSUNAMI – THE EARTH'S PANDEMONIUM

Tsunami or the harbour wave struck havoc in the Indian Ocean on the 26 December 2004. The wave was the result of the earthquake that had its epicenter close to the western boundary of Sumatra. The magnitude of the earthquake was 9.0 on the Richter scale. As the Indian plate went under the Burma plate, there was a sudden movement of the sea floor, causing the earthquake. The ocean floor was displaced by about 10 – 20m and tilted in a downwardly direction. A huge mass of ocean water flowed to fill in the gap that was being created by the displacement. This marked the withdrawal of the water mass from the coastlines of the landmasses in the south and southeast Asia. After thrusting of the Indian plate below the Burma plate, the water mass rushed back towards the coastline. Tsunami travelled at a speed of about 800km. per hour, comparable to speed of commercial aircraft and completely washed away

54 OUR ENVIRONMENT

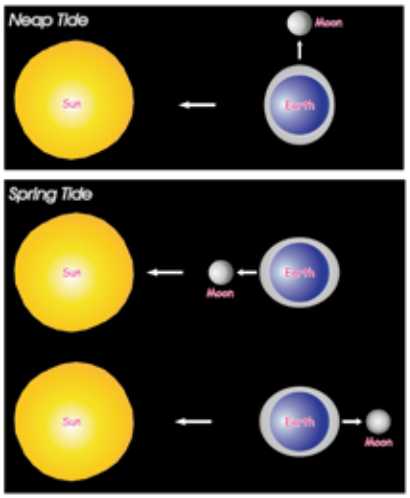


Fig. 5.5: Spring Tides and Neap Tide

The strong gravitational pull exerted by the sun and the moon on the earth's surface causes the tides. The water of the earth closer to the moon gets pulled under the influence of the moon's gravitational force and causes high tide. During the full moon and new moon days, the sun, the moon and the earth are in the same line and the tides are highest. These tides are called spring tides. But when the moon is in its first and last quarter, the ocean waters get drawn in diagonally opposite directions by the gravitational pull of sun and earth resulting in low tides. These tides are called neap tides (Fig. 5.5).

High tides help in navigation. They raise the water level close to the shores. This helps the ships to arrive at the harbour more easily. The high tides also help in fishing. Many more fish come closer to the shore during the high tide. This enables fishermen to get a plentiful catch. The rise and fall of water due to tides is being used to generate electricity in some places.

Activity

Fill three-fourths of a bucket with tap water. Heat the water by putting an immersion rod on one side of the bucket. On the other side introduce an ice tray just removed from the freezer. Add a drop of red ink to observe the path of current by the process of convection.

Ocean Currents

Ocean currents are streams of water flowing constantly on the ocean surface in definite directions. The ocean currents may be warm or cold (Fig. 5.6). Generally, the warm ocean currents originate near the equator and move towards the poles. The cold currents carry water from polar or higher latitudes to tropical or lower latitudes. The Labrador Ocean current is cold current while the Gulf Stream is a warm current. The ocean current influence the temperature conditions of the area. Warm currents bring about warm temperature over land surface. The areas where the warm and cold currents meet provide the best fishing grounds of the

Figure: Spring Tides and Neap Tides

Spring tides and neap tides can be explained by making tactile diagrams and demonstrated through activity involving 3 students to symbolise earth, moon and sun. Students can rotate and come in a line. Balls of different sizes can also be used for giving concrete experiences.

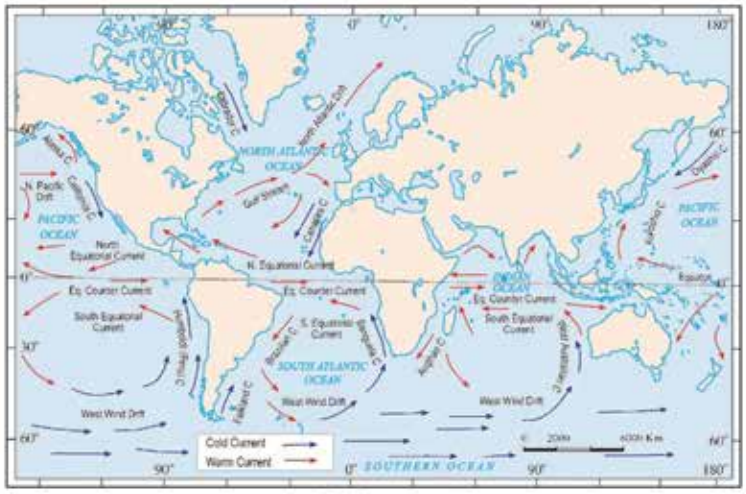


Fig. 5.6: Ocean Currents

world. Seas around Jap[illegible]nd the eastern coast of North America are such [illegible]xamples. The areas where a warm and cold curre[illegible] meet also experience foggy weather making it diff[illegible]ult for navigation.

1. Answe[illegible]e following questions.
   (i) W[illegible]t is precipitation?
   (ii) W[illegible]at is water cycle?
   (iii) [illegible]hat are the factors affecting the height of the waves?
   (iv) Which factors affect the movement of ocean water?
   [illegible] What are tides and how are they caused?
   [illegible] What are ocean currents?
2. [illegible]ive reasons.
   (i) Ocean water is salty.
   (ii) The quality of water is deteriorating.

WATER 57

Map: Ocean Currents

This map can be replaced by a chart in Braille showing origin of currents with tactile arrows. (Map could be a cluttered information in this case).

An enlarged map can be given to a low vision child. Verbal description with examples is also important for their understanding.

Adapting a Sample Chapter

Subject: Mathematics, Class – IV (Mathematics)

Sample pages from Chapter 4 "Basic Geometrical Ideas" with Suggestions:

Basic Geometrical Ideas

Chapter 4

4.1 Introduction

Geometry has a long and rich history. The term 'Geometry' is the English equivalent of the Greek word '*Geometron*'. '*Geo*' means Earth and '*metron*' means Measurement. According to historians, the geometrical ideas sh... in ancient times, probably due to the need in art, architecture and measurement. These include occasions when the boundaries of cultivated lands had to be marked without giving room for complaints. Construction of magnificent palaces, temples, lakes, dams and cities, art and architecture propped up these ideas. Even today geometrical ideas are reflected in all forms of art, measurements, architecture, engineering, cloth designing etc. You observe and use different objects like boxes, tables, books, the tiffin box you carry to your school for lunch, the ball with which you play and so on. All such objects have different shapes. The ruler which you use, the pencil with which you write are straight. The pictures of a bangle, the one rupee coin or a ball appear round.

Here, you will learn some interesting facts that will help you know more about the shapes around you.

4.2 Points

By a sharp tip of the pencil, mark a dot on the paper. Sharper the tip, thinner will be the dot. This almost invisible tiny dot will give you an idea of a point.

Geometrical Ideas

can be explained with verbal description and concrete experiences (by touching various shapes etc.). This will help in better understanding, especially by children who have little or no knowledge of spatial concepts (because of lack of vision).

Idea of Point

Use objects like tip of compass/ tip of stylus (used for Braille writing) to explain. Children with VI are familiar with these objects.

Basic Geometrical Ideas

Chapter 4

4.1 Introduction

Geometry has a long and rich history. The term 'Geometry' is the English equivalent of the Greek word '*Geometron*'. '*Geo*' means Earth and '*metron*' means Measurement. According to historians, the geometrical ideas shaped up in ancient times, probably due to the need in art, architecture and measurement. These include occasions when the boundaries of cultivated lands had to be marked without giving room for complaints. Construction of magnificent palaces, temples, lakes, dams and cities, art and architecture propped up these ideas. Even today geometrical ideas are reflected in all forms of art, measurements, architecture, engineering, cloth designing etc. You observe and use different objects like boxes, tables, books, the tiffin box you carry to your school for lunch, the ball with which you play and so on. All such objects have different shapes. The ruler which you use, the pencil with which you write are straight. The pictures of a bangle, the one

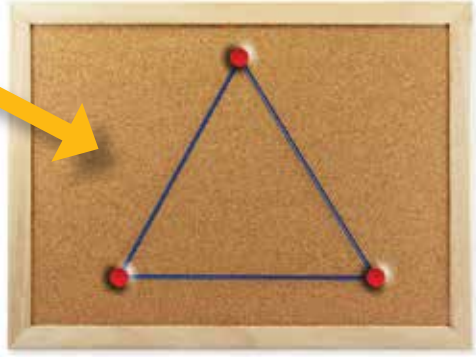
s that will help you know more

paper. Sharper the tip, thinner vill give you an idea of a point.

Knowing about Objects of different Shapes

A child with visual impairment can learn about shapes by either touching various objects/cutouts of different shapes or through preparing shapes on the Taylor frame/drawing board/pinning board etc. in the following way:

- *Putting 3 types/pins on the Taylor frame/board;*
- *Joining these with rubber band or thread.*



A point determines a location.

These are some models for a point :

If you mark three points on a paper, you would be required to distinguish them. For this they are denoted by a single capital letter like A,B,C.

The tip of a compass

The sharpened end of a pencil

The pointed end of a needle.

•B
•A
•C

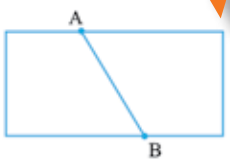
These points will be read as point A, point B and point C.

Of course, the dots have to be invisibly thin.

Try These

1. With a sharp tip of the pencil, mark four points on a paper and name them by the letters A,C,P,H. Try to name these points in different ways. One such way could be this A• •C P• •H
2. A star in the sky also gives us an idea of a point. Identify at least five such situations in your daily life.

4.3 A Line Segment



piece of paper and unfold it. Do you see a fold? ... the idea of a line segment. It has two end points ...

Take a thin thread. Hold ... ends and stretch it without a slack. It represents ... segment. The ends held by hands are the end points of the line segment.

Line Segment

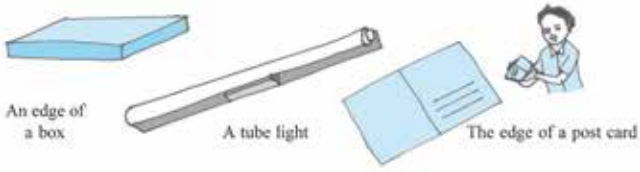
The paper folding activity given can be adapted. After folding the paper, it can be made tactual by scratching and can be unfolded. A child with VI can touch and understand the concept of line/line segment.

Try These

Diagrams can be embossed or made tactile using drawing boards/ geo-tactile boards and the labels can be transcribed in Braille.

Glue, strings, wires, shoe laces, paint, beads etc. can be used for making the diagram tactile.

The following are some models for a line segment :



Try to find more examples for line segments from your surroundings.

Mark any two points A and B on a sheet of paper. Try to connect A to B by all possible routes. (Fig 4.1)

What is the shortest route from A to B?

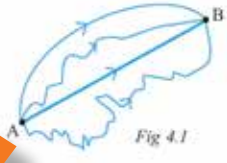


Fig 4.1

This shortest join of point A to B (including A and B) shown here is a line segment. It is denoted as AB or BA. The points A and B are called the end points of the line segment.

Try These

1. Name the line segments in the figure 4.2. Is A, the end point of each line segment?

Fig 4.2

4.4 A Line

Imagine that the line segment from A to B (i.e. $\overline{AB}$) is extended beyond A in one direction and beyond B in the other direction without any end (see figure). You now get a model for a line.

Do you think you can draw a complete picture of a line? No. (Why?)

A line through two points A and B is written as $\overleftrightarrow{AB}$. It extends indefinitely in both directions. So it contains a countless number of points. (Think about this).

Two points are enough to fix a line. We say 'two points determine a line'.

The adjacent diagram (Fig 4.3) is that of a line PQ written as $\overleftrightarrow{PQ}$. Sometimes a line is denoted by a letter like *l*, *m*.

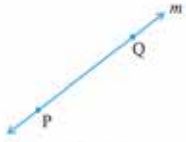
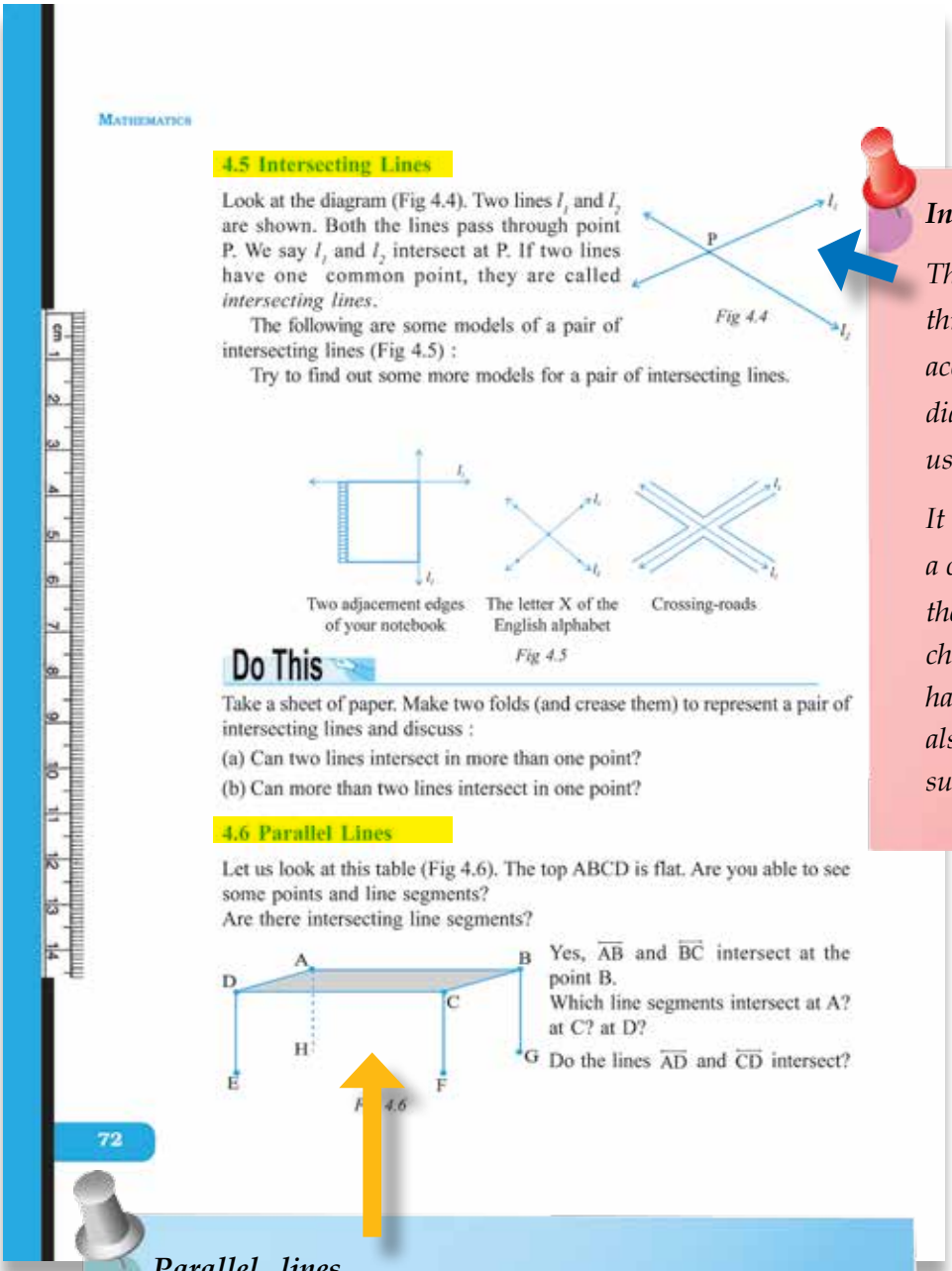


Fig 4.3



MATHEMATICS

4.5 Intersecting Lines

Look at the diagram (Fig 4.4). Two lines l_1 and l_2 are shown. Both the lines pass through point P. We say l_1 and l_2 intersect at P. If two lines have one common point, they are called *intersecting lines*.

Fig 4.4

The following are some models of a pair of intersecting lines (Fig 4.5) :

Try to find out some more models for a pair of intersecting lines.

Two adjacement edges of your notebook | The letter X of the English alphabet | Crossing-roads

Fig 4.5

Do This

Take a sheet of paper. Make two folds (and crease them) to represent a pair of intersecting lines and discuss :

(a) Can two lines intersect in more than one point?

(b) Can more than two lines intersect in one point?

4.6 Parallel Lines

Let us look at this table (Fig 4.6). The top ABCD is flat. Are you able to see some points and line segments?

Are there intersecting line segments?

Yes, $\overline{AB}$ and $\overline{BC}$ intersect at the point B.

Which line segments intersect at A? at C? at D?

Do the lines $\overline{AD}$ and $\overline{CD}$ intersect?

Fig 4.6

Intersecting Lines

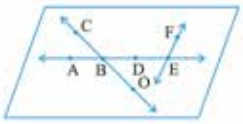
This can be taught through verbal narrative accompanied by tactile diagram for the VI by using pins/thread etc.

It can be taught through a classroom activity with the teacher asking the children to cross their hands. A child with VI can also cross hands with the support of a peer.

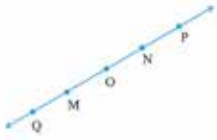
Parallel lines

Verbal descriptions can be accompanied by classroom activity using arms stretched out in front as parallel lines; and a child with VI can do the same activity with the support of a peer. Parallel lines can also be shown through the Taylor Frame. Alternatively we can use ribbons/ thread/wire etc. and tie it in from one corner to another to explain the concept of parallel lines.

3. Use the figure to name :
   (a) Line containing point E.
   (b) Line passing through A.
   (c) Line on which O lies
   (d) Two pairs of intersecting lines.



4. How many lines can pass through (a) one given point? (b) two given points?
5. Draw a rough figure and label suitably in each of the following cases:
   (a) Point P lies on $\overline{AB}$.
   (b) $\overline{XY}$ and $\overline{PQ}$ intersect at M.
   (c) Line l contains E and F but not D.
   (d) $\overrightarrow{OP}$ and $\overrightarrow{OQ}$ meet at O.
6. Consider the following figure of line $\overleftrightarrow{MN}$. Say whether following statements are true or false in context of the given figure.
   (a) Q, M, O, N, P are points on the line $\overleftrightarrow{MN}$.
   (b) M, O, N are points on a line segment $\overline{MN}$.
   (c) M and N are end points of line segment $\overline{MN}$.
   (d) O and N are end points of line segment $\overline{OP}$.
   (e) M is one of the end points of line segment $\overline{QO}$.
   (f) M is point on ray $\overrightarrow{OP}$.
   (g) Ray $\overrightarrow{OP}$ is different from ray $\overrightarrow{QP}$.
   (h) Ray $\overrightarrow{OP}$ is same as ray $\overrightarrow{OM}$.
   (i) Ray $\overrightarrow{OM}$ is not opposite to ray $\overrightarrow{OP}$.
   (j) O is not an initial point of $\overrightarrow{OP}$.
   (k) N is the initial point of $\overrightarrow{NP}$ and $\overrightarrow{NM}$.



4.8 Curves

Have you ever taken a piece of paper and just doodled? The pictures that are results of your doodling are called *curves*.

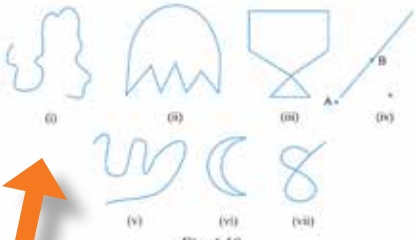


Fig 4.10

54

Curves

Pictures of Curves can be explained through drawing/showing curves using rubber bands (thick ones) and geo board. Curves can be enlarged/made tactile. However, verbal descriptions are necessary even with tactile diagrams. Molding Clay can also be used to explain curves.

4.13 Circles

In our environment, you find many things that are round, a wheel, a bangle, a coin etc. We use the round shape in many ways. It is easier to roll a heavy steel tube than to drag it.

A circle is a simple closed curve which is not a polygon. It has some very special properties.

Do This

- Place a bangle or any round shape; trace around to get a circle.
- If you want to make a circular garden, how will you proceed?

Take two sticks and a piece of rope. Drive one stick into the ground. This is the centre of the proposed circle. Form two loops, one at each end of the rope. Place one loop around the stick at the centre. Put the other around the other stick. Keep the sticks vertical to the ground. Keep the rope taut all the time and trace the path. You get a circle.

Naturally every point on the circle is at equal distance from the centre.

Parts of a circle

Here is a circle with *centre* C (Fig 4.24)

A, P, B, M are points on the circle. You will see that CA = CP = CB = CM.

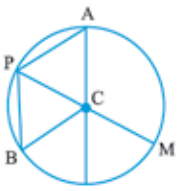


Fig 4.24

Each of the segments $\overline{CA}$, $\overline{CP}$, $\overline{CB}$, $\overline{CM}$ is *radius* of the circle. The radius is a line segment that connects the centre to a point on the circle. $\overline{CP}$ and $\overline{CM}$ are radii (plural of 'radius') such that C, P, M are in a line. $\overline{PM}$ is known as *diameter* of the circle.

Is a diameter double the size of a radius? Yes.

$\overline{PB}$ is a *chord* connecting two points on a circle. Is $\overline{PM}$ also a chord?

An arc is a portion of circle.

If P and Q are two points you get the arc PQ. We write it as $\overset{\frown}{PQ}$ (Fig 4.25).

Fig 4.25

As in the case of any simple closed curve you can think of the *interior* and *exterior* of a circle. A region in the interior of a circle enclosed by an arc on one

Do this

This activity can be explained verbally. Concept of circle, radius etc. can also be explained through raised or embossed diagram.

Adapting a Sample Chapter

Subject: Science, Class – VII (Science)

Sample pages from Chapter 2 "Nutrition in Animals" with Suggestions:

2 Nutrition in Animals

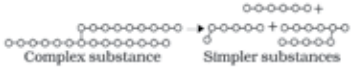
You have learnt in Chapter 1 that plants can prepare their own food by the process of photosynthesis but animals cannot. Animals get their food from plants, either directly by eating plants or indirectly by eating animals that eat plants. Some animals eat both plants and animals. Recall that all organisms including humans require food for growth, repair and functioning of the body. **Animal nutrition includes nutrient requirement, mode of intake of food and its utilisation in the body.**

You have studied in Class VI that food consists of many components. Try to recall and list them below:

1. _____

The table can be transcribed in Braille.

ts of food such a
complex substances.
bstances cannot be
So they are broken
r substances. The
breakdown of complex components of



food into simpler substances is called **digestion**.

2.1 Different Ways of Taking Food

The mode of taking food into the body varies in different organisms. Bees and humming-birds suck the nectar of plants, infants of human and many other animals feed on mother's milk. Snakes like the python swallow the animals they prey upon. Some aquatic animals filter tiny food particles floating nearby and feed upon them.

Activity 2.1

What is the type of food and mode of feeding of the following animals? Write down your observations in the given Table. You may find the list of modes of feeding given below the Table helpful.

Table 2.1 Various modes of feeding

Name of animal	Kind of food	Mode of feeding
Snail		
Ant		
Eagle		
Humming-bird		
Lice		
Mosquito		
Butterfly		
House fly		

(Scraping, chewing, siphoning, capturing and swallowing, sponging, sucking etc.)

Amazing fact

Starfish feeds on animals covered by hard shells of calcium carbonate. After opening the shell, the starfish pops out its stomach through its mouth to eat the soft animal inside the shell. The stomach then goes back into the body and the food is slowly digested.

Fig. 2.1 Starfish

2.2 Digestion in Humans

We take in food through the mouth, digest and utilise it. The unused parts of the food are defected. Have you ever wondered what happens to the food inside the body? The food passes through a continuous canal (Fig. 2.2) which begins at the buccal cavity and ends at the anus. The canal can be divided into various compartments: (1) the **buccal cavity**, (2) foodpipe or **oesophagus**, (3) **stomach**, (4) **small intestine**, (5) **large intestine** ending in the **rectum** and (6) the **anus**. Is it not a very long path? These parts together form the **alimentary canal (digestive tract)**. The food components gradually get digested as food travels through the various compartments. The inner walls of the stomach and the small intestine, and the various glands associated with the canal such as **salivary glands**, the **liver** and the **pancreas** secrete digestive juices. The digestive juices convert complex

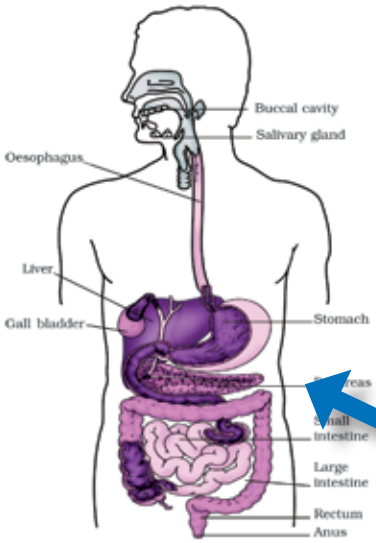


Fig. 2.2 Human digestive system

substances of food into simpler ones. The digestive tract and the associated glands together constitute the **digestive system**.

Now, let us know what happens to the food in different parts of the digestive tract.

The mouth and buccal cavity

Food is taken into the body through the mouth. The process of taking food into

Starfish

can be explained through embossed model and features can be explained verbally.

Human Digestive System

Model of Digestive System can be used for the entire class. Make use of a ball of wool or thread to explain coiling of large intestine.

Actual Dentures *can be used to demonstrate the arrangement of teeth and different types of teeth. Alternatively children can touch their own teeth to understand the difference between different types of teeth.*

Milk teeth and permanent teeth

Do you remember about falling of your teeth some years ago? The first set of teeth grows during infancy and they fall off at the age between six to eight years. These are termed **milk teeth**. The second set that replaces them are the **permanent teeth**. The permanent teeth may last throughout life or fall off during old age or due to some dental disease.

Boojho is fascinated by the highly coiled small intestine seen in Fig. 2.2. He wants to know its length. Would you like to make a wild guess? We have given its approximate length on page 16. Just imagine how such a long structure is accommodated in a small space within our body!

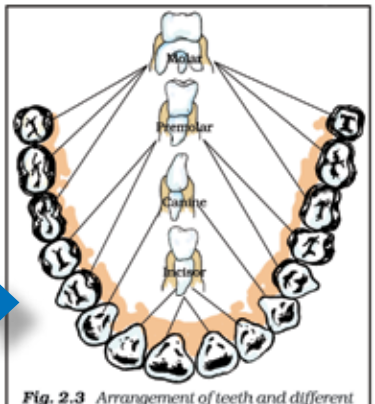


Fig. 2.3 *Arrangement of teeth and different type of teeth*

body is called **ingestion**. We chew food with the teeth and break it mechanically into small pieces. tooth is rooted in a separate socket e gums (Fig. 2.3). Our teeth vary in arance and perform different ions. Accordingly they are given ent names (Fig. 2.3).

vity 2.2

Wash your hands. Look into the mirror and count your teeth. Use your index finger to feel the teeth. How many kinds of teeth could you find? Take a piece of an apple or bread and eat it. Which teeth do you use for biting and cutting, and which ones for piercing and tearing? Also find out the ones that are used for chewing and grinding?

Record your observations in Table 2.2

Table 2.2

Type of teeth	Number of teeth		Total
	Lower jaw	Upper jaw	
Cutting and biting teeth			
Piercing and tearing teeth			
Chewing and grinding teeth			

NUTRITION IN ANIMALS 13

The table can be transcribed in Braille. Information can also be conveyed orally.

Our mouth has the salivary glands which secrete saliva. Do you know the action of saliva on food? Let us find out.

Activity 2.3

Take two test tubes. Label them 'A' and 'B'. In test tube 'A' put one teaspoonful of boiled rice; in test tube 'B' keep one teaspoonful of boiled rice after chewing it for 3 to 5 minutes. Add 3–4 mL of water in both the test tubes (Fig. 2.4). Now pour 2–3 drops of iodine solution in each test tube and observe. Why is there a change in colour in the test tubes? Discuss the results with your classmates and your teacher. The **saliva** breaks down the **starch** into sugars.

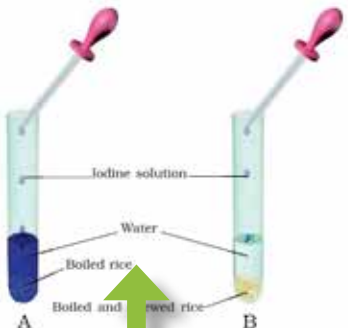


Fig. 2.4 Effect of saliva on starch

The tongue is a fleshy muscular organ attached at the back to the floor of the buccal cavity. It is free at the front and can be moved in all directions. Do you know the functions of the tongue? We use our tongue for talking. Besides, it mixes saliva with the food during chewing and helps in swallowing food. We also taste food with our tongue. It has taste buds that detect different tastes of food. We can find out the

Sweets and tooth decay

Normally bacteria are present in our mouth but they are not harmful to us. However, if we do not clean our teeth and mouth after eating, many harmful bacteria also begin to live and grow in it. These bacteria break down the sugars present from the leftover food and release acids (see Chapter 5 to know what an acid is). The acids gradually damage the teeth (Fig. 2.5). This is called **tooth decay**. If it is not treated in time, it causes severe toothache and in extreme cases results in tooth loss. Chocolates, sweets, soft drinks and other sugar products are the major culprits of tooth decay.

Therefore, one should clean the teeth with a brush or *datun* and dental floss (a special strong thread which is moved between two teeth to take out trapped food particles) at least twice a day and rinse the mouth after every meal. Also, one should not put dirty fingers or any unwashed object in the mouth.

Fig. 2.5 Gradual decay of tooth

Change of colour can be explained through names.

Raised tactile diagram can be used to show the location of taste buds for different tastes. Also, enlarged diagram with proper contrasts will be useful for some children.

Sometimes when you eat in a hurry, talk or laugh while eating, you may cough, get hiccups or a choking sensation. This happens when food particles enter the windpipe. The windpipe carries air from the nostrils to the lungs. It runs adjacent to the foodpipe. But inside the throat, air and food share a common passage. Then how is food prevented from entering the windpipe? During the act of swallowing a flap-like valve closes the passage of the windpipe and guides the food into the foodpipe. If, by chance, food particles enter the windpipe, we feel choked, get hiccups or cough.

Fig. 2.6 *Regions of the tongue for different tastes*

position of taste buds by the following activity.

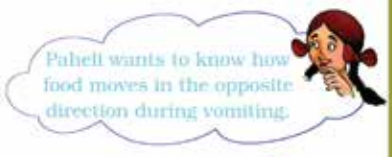
Activity 2.4

1. Prepare a separate sample each of (i) sugar solution, (ii) common salt solution, (iii) lemon juice and (iv) juice of crushed neem leaf or bitter gourd.
2. Blindfold one of your classmates and ask her/him to take out the tongue and keep it in straight and flat position.
3. Use a clean toothpick to put the above samples one by on[e] different areas of the [to]ngue as shown in Fig. 2.[6] Use a new toothpick for each sample.
4. Ask the classma[te] which areas of the tongue could d[e]tect the sweet, salty, sour and bitt[er] substances.
5. Now write down your observations and label Fig. 2.6.

Repeat this activity with other classmates.

The foodpipe/oesophagus

The swallowed food passes into the foodpipe or oesophagus. Look at Fig. 2.2. The foodpipe runs along the neck



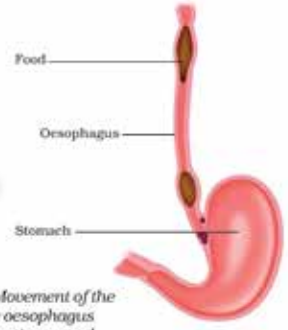
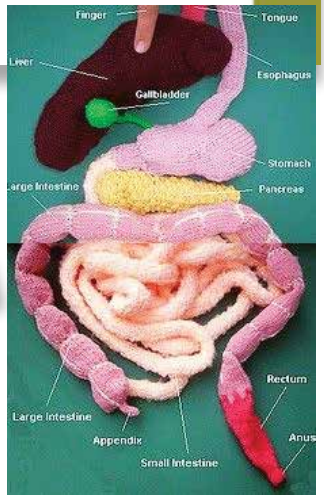
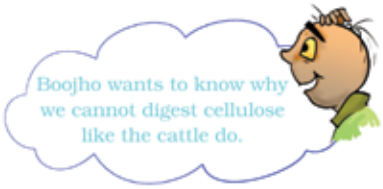


Fig. 2.7 *Movement of the food in the oesophagus of the alimentary canal*

Movement of the food in the oesophagus of the alimentary canal can be shown by making use of a socks and a ball to show how food passes. Verbal descriptions should also be given.





partially digested and is called **cud**. But later the cud returns to the mouth in small lumps and the animal chews it. This process is called **rumination** and these animals are called **ruminants**.

The grass is rich in **cellulose**, a type of carbohydrate. Many animals, including humans, cannot digest cellulose.

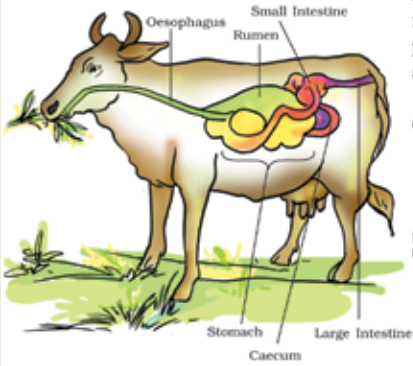


Fig. 2.9 *Digestive system of ruminant*

Ruminants have a large sac-like structure called rumen between the oesophagus and the small intestine (Fig. 2.9). The cellulose of the food is digested here by the action of certain bacteria which are not present in humans.

So far you have learnt about animals which possess the digestive system. But there are many small organisms which do not have a mouth and a digestive system. Then, how do they acquire and digest food? In the section below you will learn another interesting way of food intake.

2.4 Feeding and Digestion in Amoeba

Amoeba is a microscopic single-celled organism found in pond water. Amoeba has a cell membrane, a rounded, dense nucleus and many small bubble-like vacuoles (Fig. 2.10) in its cytoplasm. Amoeba constantly changes its shape and position. It pushes out one, or more finger-like projections, called **pseudopodia** or false feet for movement and capture of food.

Amoeba feeds on some microscopic organisms. When it senses food, it

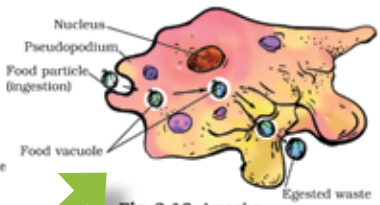


Fig. 2.10 *Amoeba*

Amoeba can be explained by using a rubber-band to show how amoeba uses pseudopodia for various purposes.

Sensory Disabilities: Hearing Impairments (HI)

When a child only has problems in hearing, then the brain is not involved and intelligence is not impaired. There is a possibility that in some children cognitive development is slower as compared to their hearing peers of the same age group but the difference is very negligible. Early assessment and intervention are also important for proper development of child's speech and language, social, educational and personality development.

Although the learning needs of children with HI may differ in terms of severity of problem and the quantity, quality and timing of the support services the children receive, this section highlights some of the common and subject specific challenges faced by these children.

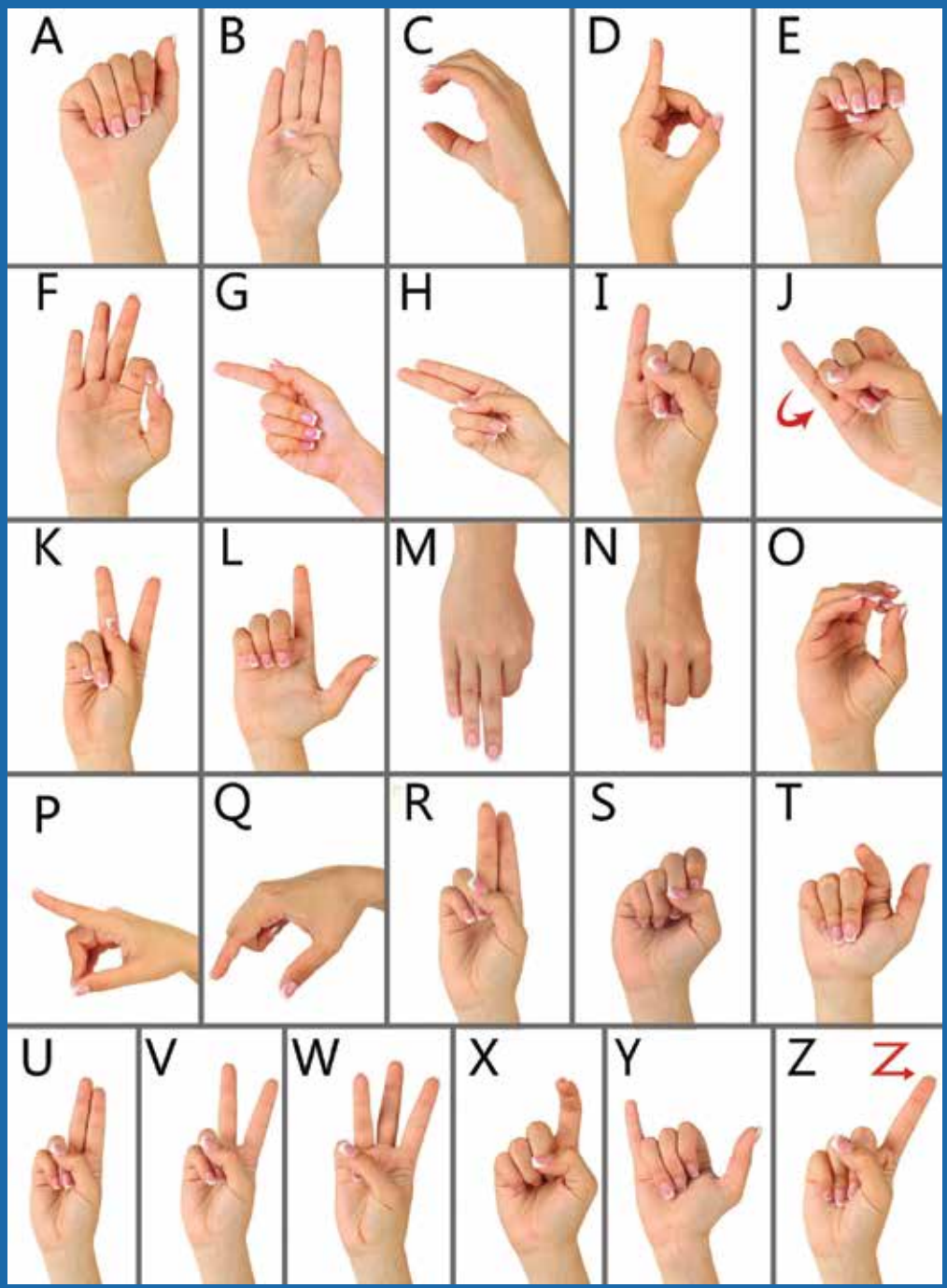
AREAS

- Development /Acquisition of Speech and Language vocabulary, syntax and figurative language(like similies, metaphors and idioms);
- Understanding of abstract concepts;
- Reading and spellings (because of difficulty in phonemic awareness and speech sound discrimination);
- Communication Skills (speaking and listening, understanding)[26];
- Mathematics[27];
- Organising ideas; and,
- Communicating ideas (although students may have lot to say on the topic, they are restricted by their vocabulary).

26 Children with HI use total communication approach that includes use of formal signs, gestures, facial expressions, body language, mime, spoken and printed words. (Turnbull,A.P., Turnbull III.H.R., Shank, M. and Leal, D.1995)

27 Mathematics is difficult for children with HI because of limited language base which may prevent them from understanding and developing mathematical language. Teacher's lack of training in using appropriate teaching strategies also adds to the difficulties faced by children with HI in gaining access to Mathematics.

Sign Language



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LANGUAGE

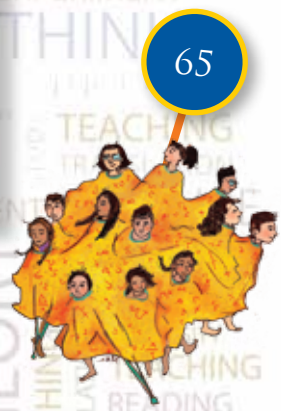
Specific Needs related to Language

- Comprehending new vocabulary
- Discriminating between words
- Understanding words with multiple meanings
- Forming connections between ideas or concepts
- Organizing thoughts or composing ideas (Composing ideas involves producing grammatically and semantically correct text at one time which may be difficult for these learners)
- Understanding and using phrases
- Grammar usage (past tense, prepositions, active and passive construction)
- Sentence construction

Equipment such as earphones and computers can help enhance the learning process of an HI child. Learning with peers further aids understanding and communication.

Tips and Strategies for Inclusion of Children with HI in Language Teaching and Learning

- Prepare visual vocabulary sheet on the topic taught (displaying words with pictures)[28].
- Write new vocabulary words on the chalk board. One can use dictionary of words with pictures, if available.
- Relate new vocabulary to child's daily life and repeat it in different contexts.
- Make visual classroom displays with captions and explanations.
- Write foot-notes along with examples for comprehension.
- Verbs used in sentences, can be taught through dramatisation.
- Use multiple modes of communication (verbal and non-verbal cues) like gestures, signing, lip/speech reading, facial expression, graphics, cartoons (speech balloons), pictures, symbols, concrete objects and examples to assist in comprehension.
- Break and summarise and rephrase the text in short and simple sentences.
- Make children write on topics related to their everyday life in simple forms such as diary, dialogue, journal etc.
- Give repeated exercises on sentence construction so that the child can learn to use words and phrases correctly. Use examples from pictures/news/current events/scrapbook etc.
- Provide or adapt reading materials and resource material at appropriate reading levels of the child.
- Brainstorm to bring out the diverse experience of learners.
- Give numerous experiences for the target/key words in a lesson.
- Make use of colour coding (use different colours for vowels, and different for consonants) and concept maps.



28 *Teachers can also develop videos of subject vocabulary for different lessons. These can form a permanent resource for their teaching.*

Social Science

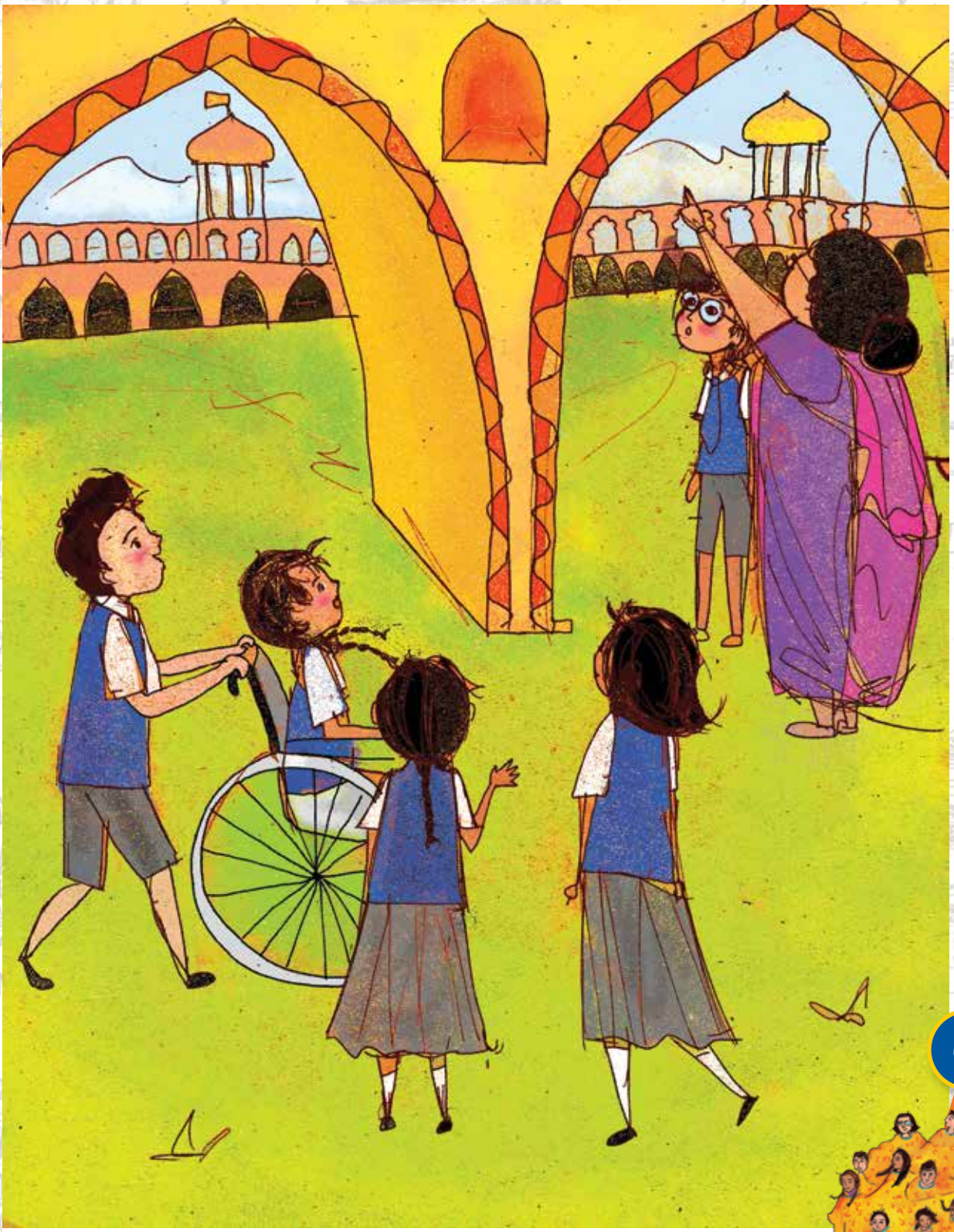
Specific Needs related to Social Sciences

- Understanding of terminologies/technical terms, abstract concepts, facts, comparisons, cause effect relationships and chronology of events etc.;
- Reading heavy text (textbooks/source materials) especially in History and Civics;
- Making inferences from the text.

Tips and Strategies for Inclusion of Children with HI in Social Science Teaching and Learning

- Give a brief overview at the beginning of each lesson.
- Provide photocopies of the relevant key information from the lesson.
- Highlight/underline the key points and words.
- Use visual/graphic organisers[29] like time lines (especially for explaining chronology of events), flow charts, posters etc.
- Organise group work involving activities like cut and paste, and make use of pictorial displays, models, pictures, posters, flash cards or any visual items to illustrate facts/concepts.
- Teach the specific meaning of the word in different contexts. For example, 'stage' in History means a period of time, in English it is used for a platform.
- Plan occasions with real life experiences. For example, plan visits to museum, excursions etc. to give insight into the context, a skit on Tilak's birthday by students to explain the importance of National Leaders, a visit to old people's home on Senior Citizen Day, an essay competition on Women's Day.
- Use films/documentaries and videos.
- Use magazines, scrapbooks and newspapers etc. to understand the textual material.
- Club together related topics across subjects. For example, teaching of forest wealth of Maharashtra in Geography can be clubbed with a poem on trees in language or with types of plants in Science.
- Draw links with what has been taught earlier.

29 *Visual representation of concepts.*



Plan visits to museum, excursions etc. to give insight into a context.

Mathematics

Specific Needs related to Mathematics

- Delay in linguistic growth, leading to lack of general vocabulary and technical vocabulary of Mathematics (words like reciprocal, linear etc.).
- Understanding the wordiness (use of a number of words to explain meaning or making a point) of mathematical problems.
- Distinguishing words with multiple meanings like interest[30], table, credit, angle, rate, volume, power, point (Kidd and Lamb ,1993).
- Distinguishing mathematical words while student is lip/speech reading (tens and tenths, sixty and sixteen).
- Limited use of cognitive strategies to select the relevant information and approaches necessary for solving problems[31].

Tips and Strategies for Inclusion of Children with HI in Mathematics Teaching and Learning

- Simplifying word problems by using informal stories, role play or dramatisation.
- Providing opportunities for a wide range of mathematical experiences like exploration and problem solving in a variety of contexts like games, everyday life problems, handling money in real shops etc.
- Increasing school and home communication so that maths vocabulary can be developed and reinforced in a variety of situations. For example, counting, handling money, etc. at home, dividing food into portions, sharing equally, weighing or measuring groceries etc.
    - Using aids like toys, coins, blocks, pens and pencils for concrete representations of the word problem.
    - Using more than one mode of presentation, for example, pictorial, symbolic.
    - Use of key words that may help students understand formulas and the meaning of the problem (like the word 'altogether' for addition); and,
    - Giving repeated exposure to formulas and their applications.

30 Interest, for example, means 'the feeling of wanting to know or learn about something or someone' or 'money paid regularly at a particular rate for the use of money lent or for delaying the repayment of a debt' retrieved from https://www.google.co.in/?gws_rd=ssl#q=interest+dictionary+meaning

31 For example, children may face difficulty in organizing information in appropriate schema, sequencing of tasks (greater than-lesser than), writing in order etc.

Science

Specific Needs related to Science

- Understanding abstract words and the connections between abstract concepts, knowledge, ideas; (science concepts like photosynthesis, habitat, microorganisms etc. are difficult for these children to understand without visual representations.)
- Conducting experiments
- Solving problems that involve more than one dimension; For example, comparing objects on the basis of different dimensions like number, size , shape, colour may be difficult as compared to single dimension like size only.

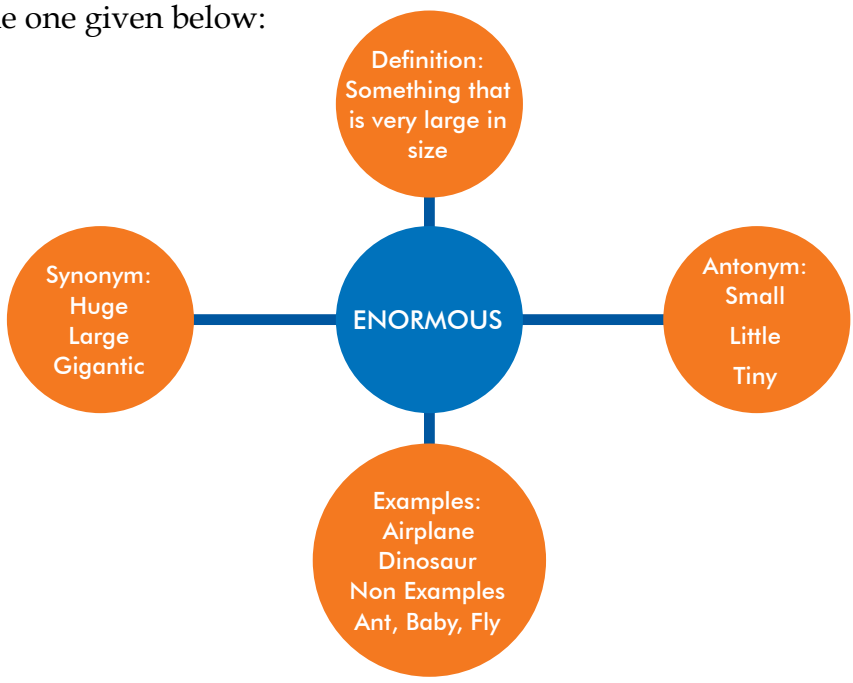
Tips and Strategies for Inclusion of Children with HI in Science Teaching and Learning

- Add a section on "what you are going to learn" before you begin the actual lesson.
- Label the pictures within the text, whenever possible. This can be done by the students as an activity.
- Use diagrams, pictures from different sources (internet, magazines, earlier classes etc., if possible) other than only present textbooks, as and when necessary.
- Make available the textbooks of earlier classes to relate to present teaching for better understanding.
- Relate the projects and experiments to real life experiences.
- Encourage group task and peer assistance for project and experiment work.
- Give the project and experiment in fewer steps and sequence the steps through visual cues. Display the example of a completed project/experiment in classroom/ or laboratory for better understanding.
- While demonstrating a procedure or a technique, deliberately alternate between speaking and manipulating the materials. This allows the student who has HI to look at one thing at a time (particularly important if the child is lip reading).
- Consider alternative/less difficult activities/exercises for the student, with same or similar learning objectives.
- Write all homework assignments and laboratory procedural changes on the chalkboard.
- Show step-by-step instructions for conducting experiments.
- Provide indicator lights for the on/off status of equipment.
- Give the student time to finish a step in an experiment and wait until the student indicates s/he is ready for further work.
- Display real-life objects that apply to the scientific concepts being taught.

Some Examples

English

- Topics across subjects can be interlinked to give a holistic (overall) idea about a concept. For example, to explain the phrase 'Frontiers of space' in English language, picture of atmosphere from Geography can be used. Similarly the word 'territory' in English language means a piece or an area of land; supporting example can be given from Science like, tigers guard their own territory etc.
- Simple questions can be asked from a paragraph to check comprehension of facts and language of the child. For example, 'What did Kalpana Chawla do after school?' or 'Where did Kalpana Chawla study after school?'.
- Students can begin writing compositions on topics of their liking. As they gain more experience in writing, more analytical and abstract topics can be introduced.
- Abstract vocabulary can be best explained through Word Maps which clarify using examples, non-examples and concrete representations. For example, to explain the word 'enormous', make a word map like the one given below:



- To develop comprehension of stories, the child can be introduced to picture stories with written statements, or the child can physically enact or dramatise the story. To give practice in recalling story sequence, the child can rearrange a series of picture cards.

Social Sciences

- Drawing linkages across subjects; For example, in Geography, we read about the Sahayadri region in Maharashtra and in History we read about Shivaji's guerilla warfare taking place in the same region; also, in Science we read about Indigo dye which is produced in Maharashtra.
- Text with loads of information involving facts and dates, particularly in History, should be reorganised in table form to reduce language load and for easier comprehension as given below:

Picture	People	Policy	Effect	Date
	Nana Saheb	Denied pension, Doctrine of Lapse	Freedom and authority	1856

- Comparing and contrasting similarities and differences between concepts can be taught through Venn diagrams. For example, students can compare and contrast two cities and their climate, vegetation etc. in a Geography lesson through these diagrams. Various colours and shapes (triangles and quadrangles) can be used to make these diagrams more effective and interesting.

Mathematics

- If combined type of questions (where 2-3 facts are combined) conform to the general practice in the area of Mathematics, it is simpler for student with HI to solve. For example, if the problem is posed as Ram has 3 oranges and Sunil has 6 oranges. How many oranges do they have?, the problem conforms to the general practice of addition of two numbers. The use of the word altogether here can provide a cue for addition. In case the problem given is Rani has 3 pencils. Rama also has some pencils. Rani and Rama have 7 pencils altogether. How many pencils does Rama have?, it is more complex in terms of language (semantics/syntactics) and the language demands are significantly greater.
- Equations in Algebra can be taught using manipulatives (concrete objects like blocks, coins, shapes, paper that is cut or folded, pictures,

number lines, and graphs of functions and relationships). For example, assign different coloured blocks to represent positive and negative numbers of an expression.

- Use of key words and signs help in learning formulas. For example, if we ask children to consider the sign '+'(addition) as depicting a weak person and '–'(substraction) as a strong person and symbol 'x' (multiplication) as fight, we can make them learn formulas like – x + = -. (If a strong person is fighting with a weak person, then the resultant victory would be of the strong person.)
- Functional Mathematics can be taught by involving the child in activities of daily living like checking the calendar, clock, calculating household expenses etc.
- Concepts of area and volume can be taught through activities involving concrete objects like blocks, magnets etc. They can also be depicted through Visual and 3D representations.

Science

- Concepts of wind flow pattern across the world or places vulnerable to cyclone can be demonstrated with the assistance of Maps and Globe.

- Sound is produced by a vibrating body – this concept can be demonstrated thr-ough activities like making the child hold a vibrating mobile phone and feeling the sound. The concept can also be taught by simple activities like rotating a *Firki* tied to thread. The child can be made to feel the rotating *Firki* and experience the vibration and sound. Drums or *tabla* also can be used to touch, feel and see the vibration and the emerging sound.

Facilitating Participation of Children with HI in Inclusive Classrooms

- Speak naturally, clearly and slowly (if required) without exaggerating lip movement.
- Encourage the child to make his/her own notes and dictionary.
- Use short, clear, simple, meaningful and to the point sentences and descriptions.
- Write on the blackboard in simple and short points while teaching and keep visual pollution (cluttering) on chalkboard to a minimum.
- Motivate other children to converse, communicate and interact with the HI child.
- Write the difficult/abstract words on the chalkboard along with meanings.
- Start a given topic by asking children questions based on their previous knowledge and write them on the blackboard for all children, including child with HI, to recollect.
- As much as possible use real life examples from the environment to explain concepts.
- Place the learner in the front row to avoid distractions and for lip/speech reading.
- Eliminate background noise.
- Let the student with HI have a clear view of the student who is speaking in the class.
- Use facial expressions, gestures and body language to convey information, if required.
- Use posters, charts, flash cards, pictures, manipulatives, graphic organisers, artifacts or any visual items to illustrate concepts.
- Present only one source of visual information at a time.
- Use written announcements (For example, assignments, due dates, exam dates, changes in the class schedule, special event dates, etc.).
- Provide an outline of the activity and your expectations from the child.
- Give necessary pauses for better understanding.
- Use multimedia for learning like text with visuals, text with sign language translation and text with answering adjunct questions (questions on the content) from the text etc.
- Use children's literature, magazines and journals while teaching different subjects in the classrooms for improving vocabulary, reading and writing skills.

ADAPTING A SAMPLE CHAPTER

SUBJECT: ENGLISH, CLASS – VIII (HONEYDEW)

Sample pages from Poem "When I set out for Lyonnesse" with Suggestions:

Concept of Lyonnesse

The Concept of this mythical place can be best explained by showing videos/ pictures/posters, depicting mythical places or persons from known legends. Visits to such places can also be planned.

When I set out for Lyonnesse

s a young apprentice architect, British poet and novelist homas Hardy once visited a parish to supervise the restoration a church. On his return from the parish, people noticed two ings about him — a new glow in his eyes and a crumpled ece of paper sticking out of his coat pocket. That paper, it is corded in one of his biographies, contained the draft of a poem. u are going to read that very poem inspired by a visit to a ace which the poet calls Lyonnesse.

When I set out for Lyonnesse
A hundred miles away,
The rime wa[illegible] the spray;
And starlight [illegible]t my lonesomeness
When I set ou[illegible]for Lyonnesse
A hundred mil[illegible]s away.

What would bec[illegible]ance at Lyonnesse
While I should s[illegible]ourn there,
No prophet durst[illegible]eclare;
Nor did the wises[illegible]izard guess
What would becha[illegible]ce at Lyonnesse
While I should sojo[illegible]rn there.

When I returned fro[illegible] Lyonnesse
With magic in my ey[illegible],
All marked with mute[illegible]urmise
My radiance rare and [illegible]thomless,
When I returned from [illegible]onnesse
With magic in my eyes.

THOMAS HARDY

Set Out

Explain through actual demonstration and by giving examples, of setting out for school or office early in the morning. Picture cues can also be used.

When I set out for Lyonnesse

As a young apprentice architect, British poet and novelist Thomas Hardy once visited a parish to supervise the restoration of a church. On his return from the parish, people noticed two things about him — a new glow in his eyes and a crumpled piece of paper sticking out of his coat pocket. That paper, it is recorded in one of his biographies, contained the draft of a poem. You are going to read that very poem inspired by a visit to a place which the poet calls Lyonnesse.

When I set out for Lyonnesse
A hundred miles away,
The rime was on the spray;
And starlight lit my lonesomeness
When I set out for Lyonnesse
A hundred miles away.

What could bechance at Lyonnesse
While I should sojourn there,
No prophet durst declare;
Nor did the wisest wizard guess
What could bechance at Lyonnesse
While I should sojourn there.

When I returned from Lyonnesse
With magic in my eyes,
All marked with mute surmise
My radiance rare and fathomless,
When I returned from Lyonnesse
With magic in my eyes.

THOMAS HARDY

Hundred Miles

Concept of miles can be explained by showing mathematical number along with the words.

Rime

You can take the students outside early in the morning to show the frost and its droplets on the leaves and flowers of the trees. Also, pictures can be shown.

Lonesomeness

Demonstrate through expression and enactment. Also a situation can be created in the class to explain it, like a group of children playing outside together, enjoying and a lonely child sitting alone in a corner/ in the class.

When I set out for Lyonnesse

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en I set out for Lyonnesse
A h ndred miles away,
The r e was on the spray;
And sta ght lit my lonesomeness
When I se ut for Lyonnesse
A hundred m es away.

What would bec nce at Lyonnesse
While I should soj n there,
No prophet durst declare;
Nor did the wisest wizard guess
What would bechance at Lyonnesse
While I should sojourn there.

When I retur from Lyonnesse
With magic in y eyes,
All marked w n mute surmise
My radiance are and fathomless,
When I retu ned Lyonnesse
With magic n my es.

Wizard – Magician

Explain by showing picture of a magician. To make the abstractness of the concept of magic clear to children teach through fun play activity like hide and seek game. Also some magic tricks with playing cards can be shown.

Mute

Explain through facial expression and demonstration, like keeping the fingers on the lip.

Guess

Explain through facial expression and demonstration. Guessing games can be organized.

Sojourn

Relate it to a trip.

When I set out for Lyonnesse

As a young apprentice architect, British poet and novelist Thomas Hardy once visited a parish to supervise the restoration of a church. On his return from the parish, people noticed two things about him — a new glow in his eyes and a crumpled piece of paper sticking out of his coat pocket. That paper, it is recorded in one of his biographies, contained the draft of a poem. You are going to read that very poem inspired by a visit to a place which the poet calls Lyonnesse.

When I set out for Lyonnesse
A hundred miles away,
The rime was on the spray;
And starlight lit my lonesomeness
When I set out for Lyonnesse
A hundred miles away.

What would bechance at Lyonnesse
While I should sojourn there,
No prophet durst declare;
Nor did the wisest wizard guess
What would bechance at Lyonnesse
While I should sojourn there.

When I returned from Lyonnesse
With magic in my eyes,
All marked with mute surmise
My radiance rare and fathomless,
When I returned from Lyonnesse
With magic in my eyes.

Thomas Hardy

The idea behind the poem is the feeling of the poet after a journey to a restored place. The idea can be explained to children through a visit to a place of restoration of a temple or restoration of a building in the locality.

The key idea of the stanza can be summarised in short and simple sentences like:

The first verse is about the poet making a long journey alone at night.

Dramatisation of poems should be encouraged with appropriate props.

glossary

Lyonnesse: (in Arthurian legend) the mythical birthplace of Sir Tristram, in England, believed to have been submerged by the sea; here an imaginary place.

rime: frost

the spray: leaves and branches of trees; foliage

durst: (poetic word for) dared

bechance: happen/chance to happen

sojourn: stay

radiance: glow

fathomless: so deep that the depth can't be measured

working with the poem

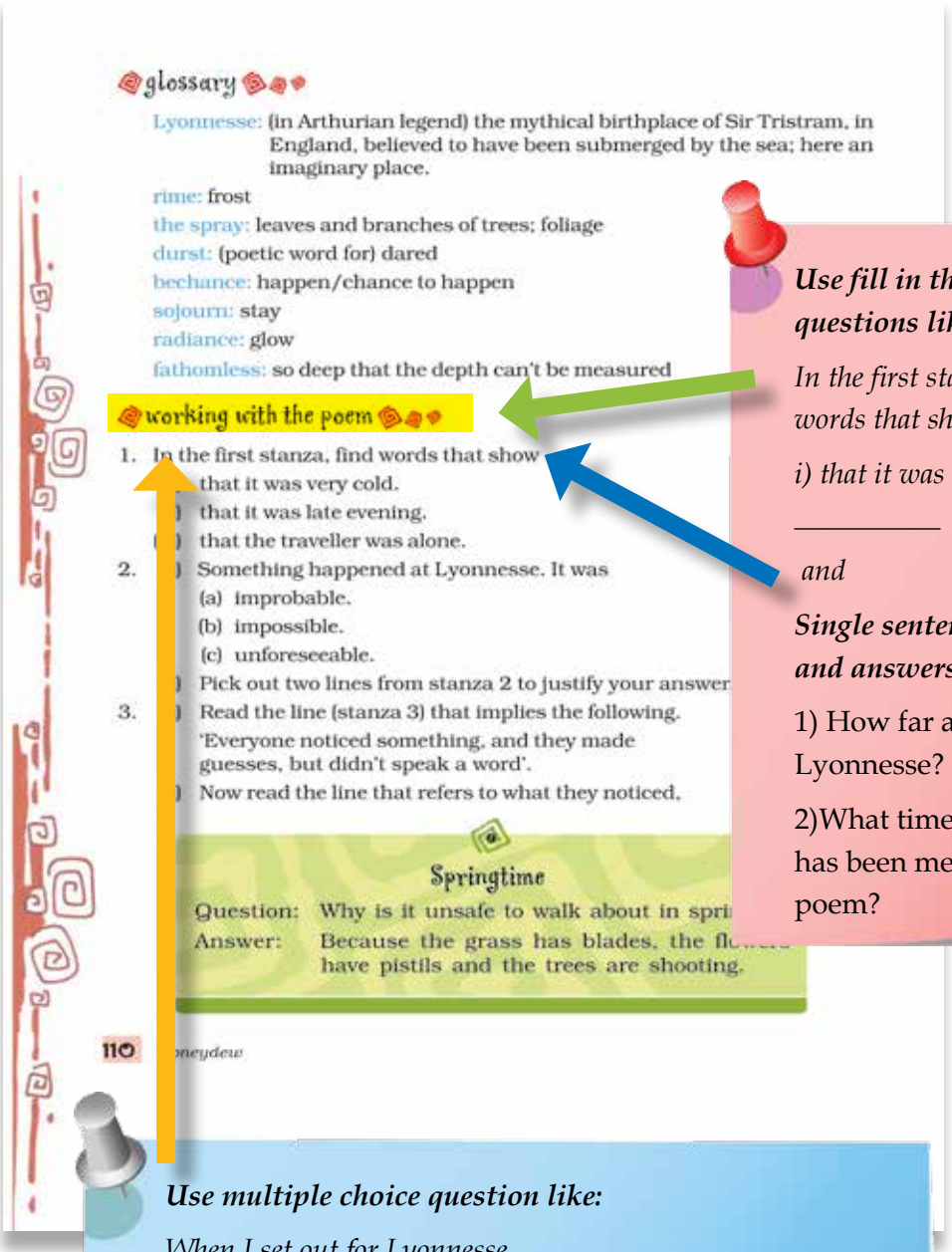
1. In the first stanza, find words that show
   (i) that it was very cold.
   (ii) that it was late evening.
   (iii) that the traveller was alone.
2. (i) Something happened at Lyonnesse. It was
   (a) improbable.
   (b) impossible.
   (c) unforeseeable.
   (ii) Pick out two lines from stanza 2 to justify your answer.
3. (i) Read the line (stanza 3) that implies the following.
   'Everyone noticed something, and they made guesses, but didn't speak a word'.
   (ii) Now read the line that refers to what they noticed.

Springtime

Question: Why is it unsafe to walk about in spring?
Answer: Because the grass has blades, the flowers have pistils and the trees are shooting.

Ask the children to make a list of the feeling words, action words and describing words from the 1/2/3 stanza of the poem.
Picture and labelling questions like showing wizard or frost and asking children to write its name would help.

Teachers can encourage imagination by asking the children to draw a strange or a mysterious place or a dream they saw.



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Springtime

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have pistils and the trees are shooting.

110 neydew

Use fill in the blank questions like:

In the first stanza, find the words that show:

i) that it was late evening _____ *('Starlight')*

and

Single sentence questions and answers like:

1) How far away was Lyonnesse?

2)What time of the day has been mentioned in the poem?

Use multiple choice question like:

When I set out for Lyonnesse
A hundred miles away,
The rime was on the spray ;
And starlight lit my lonesomeness.

Lyonnesse is
(a) a beautiful river *(b) a beautiful hill*
(c) a country in the legends *(d) an imaginary name.*

ADAPTING A SAMPLE CHAPTER

SUBJECT: GEOGRAPHY, CLASS – VII (OUR ENVIORNMENT)

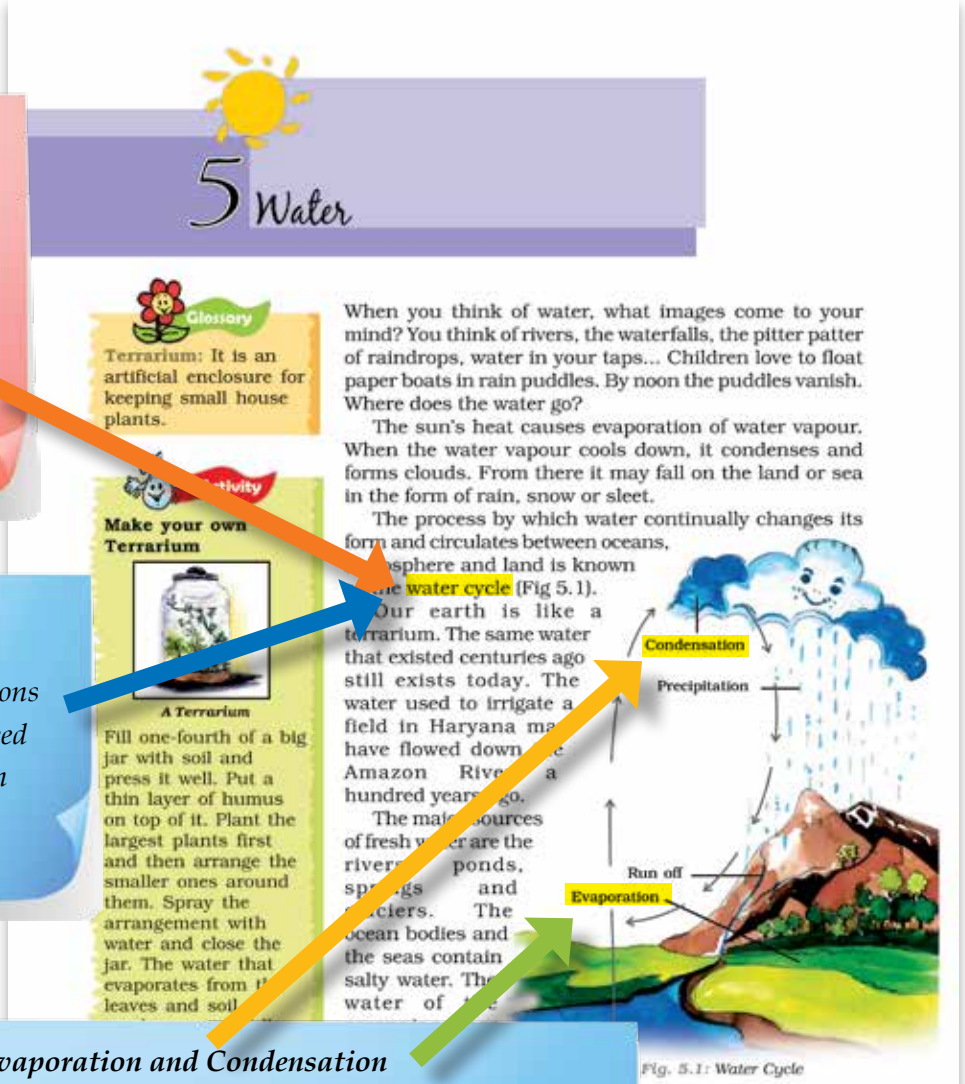
Sample pages from Chapter 5 "Water" with Suggestions:

Water Cycle* (See page 82)

Concept can be introduced by showing picture of water cycle on a chart paper. Also draw a flow chart to depict the steps.

Water Cycle

Short and simple definitions of the related concepts need to be given through Flash Cards and pictures with captions.



5 Water

Glossary

Terrarium: It is an artificial enclosure for keeping small house plants.

Activity

Make your own Terrarium

A Terrarium

Fill one-fourth of a big jar with soil and press it well. Put a thin layer of humus on top of it. Plant the largest plants first and then arrange the smaller ones around them. Spray the arrangement with water and close the jar. The water that evaporates from t leaves and soil

When you think of water, what images come to your mind? You think of rivers, the waterfalls, the pitter patter of raindrops, water in your taps... Children love to float paper boats in rain puddles. By noon the puddles vanish. Where does the water go?

The sun's heat causes evaporation of water vapour. When the water vapour cools down, it condenses and forms clouds. From there it may fall on the land or sea in the form of rain, snow or sleet.

The process by which water continually changes its form and circulates between oceans, sphere and land is known e water cycle (Fig 5.1).

Our earth is like a rrarium. The same water that existed centuries ago still exists today. The water used to irrigate a field in Haryana ma have flowed down e Amazon Rive a hundred years go.

The mai sources of fresh w er are the river ponds, sp gs and ciers. The ocean bodies and the seas contain salty water. Th water of

Condensation
Precipitation
Run off
Evaporation

Fig. 5.1: Water Cycle

80

Evaporation and Condensation

The concepts and process can be explained by using real life examples, such as, showing how water sprinkled in the classroom gets dried up or other examples like drying of wet clothes, water droplets gathered on an ice cold glass of water or with the help of demonstrations and experiments.

5 Water

Glossary

Terrarium: It is an artificial enclosure for keeping small house plants.

Activity

Make your own Terrarium

A Terrarium

Fill one-fourth of a big jar with soil and press it well. Put a thin layer of humus on top of it. Plant the largest plants first and then arrange the smaller ones around them. Spray the arrangement with water and close the jar. The water that evaporates from the leaves and soil condenses and falls back in the form of drops of water.

When you think of water, what images come to your mind? You think of rivers, the waterfalls, the pitter patter of raindrops, water in your taps... Children love to float paper boats in rain puddles. By noon the puddles vanish. Where does the water go?

The sun's heat causes evaporation of water vapour. When the water vapour cools down, it condenses and forms clouds. From there it may fall on the land or sea in the form of rain, snow or sleet.

The process by which water continually changes its form and circulates between oceans, atmosphere and land is known as the water cycle (Fig 5.1).

Our earth is like a terrarium. The same water that existed centuries ago still exists today. The water used to irrigate a field in Haryana may have flowed down the Amazon River a hundred years ago.

The major sources of fresh water are the rivers, ponds, springs and glaciers. Th ocean bodi nd the seas c in salty water. T water of th oceans is salty or saline as it contains large

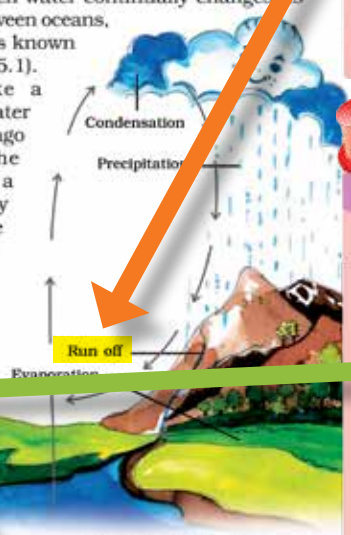


Fig. 5.1: Water Cycle

Run off

Show pictures with captions and videos of water runoff in mountains or demonstrate through simple activities like dropping water on the slant surface of a table.

Fresh Water and Saline Water

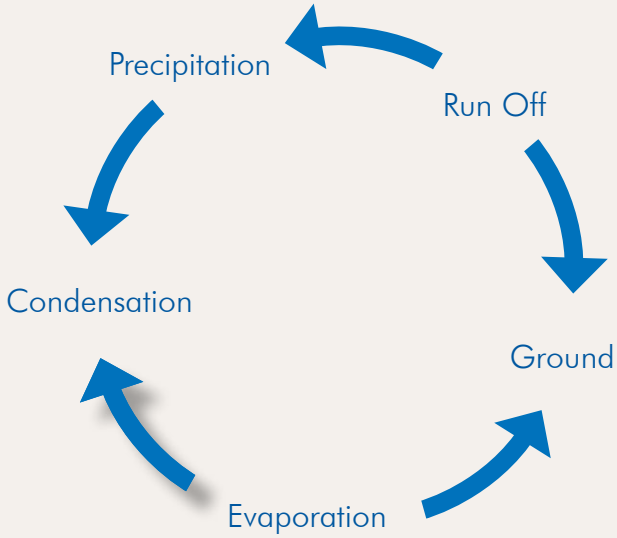
Concept of saline and fresh water can be explained by making the children taste a glass of water mixed with salt and the other without salt.

Children can also be taken to onsite visits to the nearby river or pond or tributaries.

Make a table of sources of fresh water and saline water in a chart paper along with their pictures. For example:

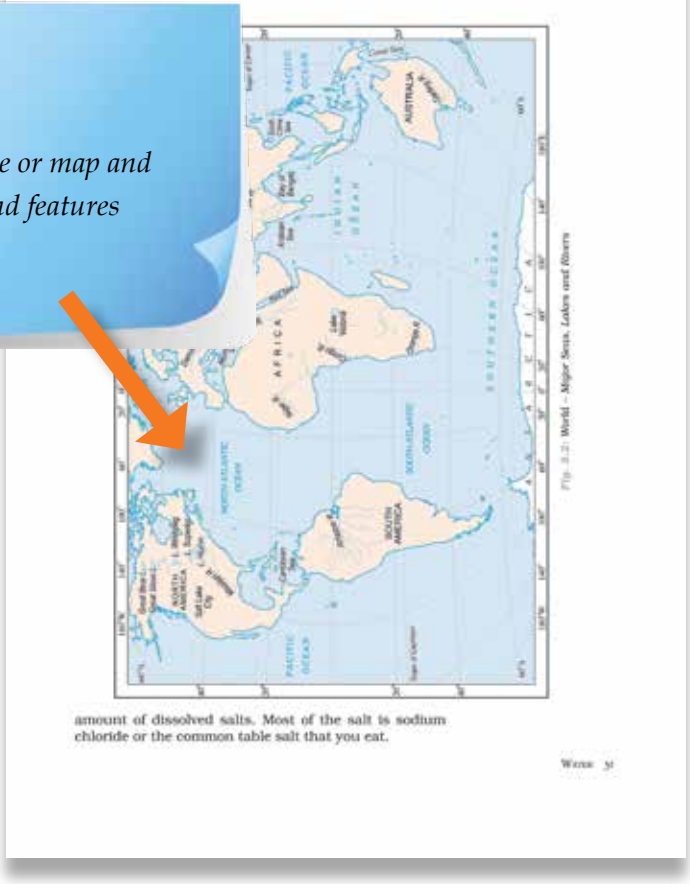
Sources of Fresh Water	Sources of Saline Water
Rivers (Picture)	Ocean (Picture)
Ponds(Picture)	Sea (Picture)

Example for Water Cycle Flow chart*



Sources of Water

Show Dead Sea on a globe or map and describe its specialities and features using visual cues.



- Why is water important for us?
- Suggest some ways in which water can be conserved (a) in your home (b) in your school

Ocean Circulation

There is something magical about walking bare feet on the seashore. The wet sand on the beach, the cool breeze, the seabirds, the smell of the salt in the air and music of the waves; everything is so fascinating. Unlike the calm waters of ponds and lakes, ocean water keeps moving continuously. It is never still. The movements that occur in oceans can be broadly categorised as: waves, tides and currents.

Do you know?

March 22 is celebrated as World Water Day when the need to conserve water is reinforced in different ways.

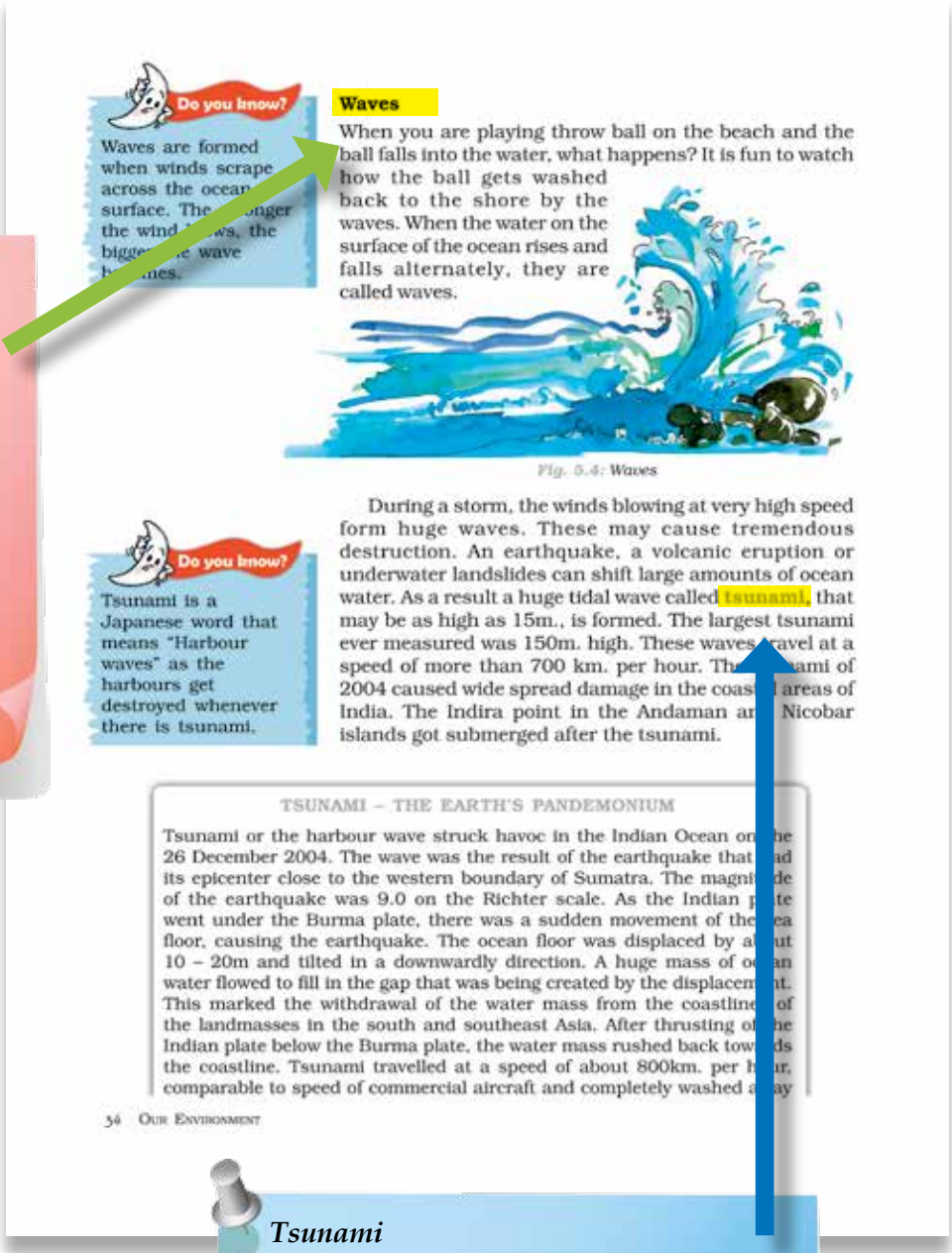
Fig. 5.3: Pacific Ocean

Oceanic Circulation

Show various types of oceanic circulation visually, for example, through graphic organiser or mind map (see Mind Map on page 105).

Waves

Waves can be explained through hand movements, actual visit if possible, demonstrations or by showing pictures and videos.



Do you know?

Waves are formed when winds scrape across the ocean surface. The longer the wind blows, the bigger the wave heights.

Waves

When you are playing throw ball on the beach and the ball falls into the water, what happens? It is fun to watch how the ball gets washed back to the shore by the waves. When the water on the surface of the ocean rises and falls alternately, they are called waves.

Fig. 5.4: Waves

Do you know?

Tsunami is a Japanese word that means "Harbour waves" as the harbours get destroyed whenever there is tsunami.

During a storm, the winds blowing at very high speed form huge waves. These may cause tremendous destruction. An earthquake, a volcanic eruption or underwater landslides can shift large amounts of ocean water. As a result a huge tidal wave called tsunami, that may be as high as 15m., is formed. The largest tsunami ever measured was 150m. high. These waves travel at a speed of more than 700 km. per hour. The tsunami of 2004 caused wide spread damage in the coastal areas of India. The Indira point in the Andaman and Nicobar islands got submerged after the tsunami.

TSUNAMI – THE EARTH'S PANDEMONIUM

Tsunami or the harbour wave struck havoc in the Indian Ocean on the 26 December 2004. The wave was the result of the earthquake that had its epicenter close to the western boundary of Sumatra. The magnitude of the earthquake was 9.0 on the Richter scale. As the Indian plate went under the Burma plate, there was a sudden movement of the sea floor, causing the earthquake. The ocean floor was displaced by about 10 – 20m and tilted in a downwardly direction. A huge mass of ocean water flowed to fill in the gap that was being created by the displacement. This marked the withdrawal of the water mass from the coastline of the landmasses in the south and southeast Asia. After thrusting of the Indian plate below the Burma plate, the water mass rushed back towards the coastline. Tsunami travelled at a speed of about 800km. per hour, comparable to speed of commercial aircraft and completely washed away

54 OUR ENVIRONMENT

Tsunami

Tsunami and its devastating effects can be demonstrated in classroom through plays, dramas, video and pictures for effective understanding. The places where Tsunami stuck can be shown in maps and globe.

some of the islands in the Indian ocean. The Indira point in the Andaman and Nicobar islands that marked the southernmost point of India got completely submerged. As the wave moved from earthquake epicenter from Sumatra towards the Andaman islands and Sri Lanka the wave length decreased with decreasing depth of water. The travel speed also declined from 700-900km. per hour to less than 70km. per hour. Tsunami waves travelled upto a depth of 3 km. from the coast killing more than 10,000 people and affected more than lakh of houses. In India, the worst affected were the coastal areas of Andhra Pradesh, Tamil Nadu, Kerala, Puducherry and the Andaman and Nicobar Islands.

While the earthquake cannot be predicted in advance, it is possible to give a three-hour notice of a potential tsunami. Such early warning systems are in place across the Pacific ocean, but not in the Indian Ocean. Tsunamis are rare in the Indian Ocean as the seismic activity is less as compared to the Pacific.

Destruction caused by tsunami on Tamil Nadu Coast

The tsunami that ravaged the South and South east Asian coasts in December 2004, is the most devastating tsunami in the last several hundred years. The large damage caused to life and property was primarily a result of lack of monitoring, the early warning systems and knowledge among the coast dwellers of Indian ocean.

The first indication that tsunami is approaching is rapid withdrawal of water from the coastal region, followed by de wave. When this happened on the coast, instead of people goi ground, they started assembling at the coast to view the mira consequence there was a large casualty of curious onlookers gigantic wave (tsunami) struck.

Tides

The rhythmic rise and fall of ocean water twice in a day is called a tide. It is high tide when water covers much of the shore by rising to its highest level. It is low tide when water falls to its lowest level and recedes from the shore.

Tide

The rhythmic rise and fall of tides can be shown by drawing it on the blackboard and also through hand movements and signs. Actual visits, if possible, can be taken up.

Adapting a Sample Chapter

Subject: Mathematics, Class – VIII (Mathematics)

Sample pages from Chapter 2 "Linear Equations in Two Variables" with Suggestions

Key Mathematical Words

Prepare a list of mathematical vocabulary of the chapter on a chart with their meanings. Display the chart in the classroom before starting the lesson. Let the students ask questions to clarify their doubts. For example, key words in this chapter include –

Linear, Equation

CHAPTER 2

Linear Equations in One Variable

Introduction

...l **algebraic expressions** and **equations**.

...examples of expressions we have so far worked with are:

$5x,\ 2x-3,\ 3x+y,\ 2xy+5,\ xyz+x+y+z,\ x^2+1,\ y+y^2$

...examples of equations are: $5x=25,\ 2x-3=9,\ 2y+\frac{5}{2}=\frac{37}{2},\ 6z+10=-2$

...ould remember that equations use the *equality* (=) sign; it is missing in expressions. ...these given expressions, many have more than one variable. For example, $2xy+5$ ...variables. We however, restrict to expressions with only one variable when we ...uations. Moreover, the expressions we use to form equations are linear. This means ...highest power of the variable appearing in the expression is 1.

...re linear expressions:

$2x,\ 2x+1,\ 3y-7,\ 12-5z,\ \frac{5}{4}(x-4)+10$

...are **not** linear expressions:

$x^2+1,\ y+y^2,\ 1+z+z^2+z^3$ (si... highest power of variable > 1)

Here we will deal with equations with ...ear expressions in one variable only. Such equations are known as **linear equations i... one variable**. The simple equations which you studied in the earlier classes were all of ...s type.

...equation

Signs in the equation should go one below the other. For example, the equation (2x-7=2X5-7=10-7=3) can be written as:

2x - 7
= 2X5 - 7
= 10 - 7
= 3

Thus $\frac{107}{21}$ should be added to $2 \times \left(\frac{-7}{3}\right)$ to give $\frac{3}{7}$.

Example 6: The perimeter of a rectangle is 13 cm and its width is $2\frac{3}{4}$ cm. Find its length.

Solution: Assume the length of the rectangle to be x cm.

The perimeter of the rectangle = 2 × (length + width)

$$= 2 \times (x + 2\frac{3}{4})$$

$$= 2\left(x + \frac{11}{4}\right)$$

The perimeter is given to be 13 cm. Therefore,

$$2\left(x + \frac{11}{4}\right) = 13$$

or $$x + \frac{11}{4} = \frac{13}{2}$$ (dividing both sides by 2)

or $$x = \frac{13}{2} - \frac{11}{4}$$

$$= \frac{26}{4} - \frac{11}{4} = \frac{15}{4} = 3\frac{3}{4}$$

The length of the rectangle is $3\frac{3}{4}$ cm.

Example 7: The present age of Sahil's mother is three times the present age of Sahil. After 5 years their ages will add to 66 years. Find their present ages.

Solution: Let Sahil's present age be x years.

We could also choose Sahil's age 5 years later to be x and proceed. Why don't you try it that way?

	Sahil	Mother	Sum
Present age	x	$3x$	
Age 5 years later	$x + 5$	$3x + 5$	$4x + 10$

It is given that this sum is 66 years

Therefore, $4x + 10 = 66$

For solving word problems, identify the variables and key words from the word problem and display visually, like putting in a chart form/table or underline them for recall. The key words can be:

- *than*
- *present age*
- *age of Sahil*
- *three times*

Provide written instruction for each step like:

- *Sahil's age. Take 'of' as x*
- *Mother's age how many times more? 'three times' or 3x*
- *Sahil's age after 5 years is x+5.*
- *Mother's age after 5 years is 3x+5.*

we transpose 10 to RHS,

or $4x = 66 - 10$

or $4x = 56$

$x = \frac{56}{4} = 14$ (solution)

Thus, Sahil's present age is 14 years and his mother's age is 42 years. (You may easily check that 5 years from now the sum of their ages will be 66 years.)

Example 8: Bansi has 3 times as many two-rupee coins as he has five-rupee coins. If he has in all a sum of ₹ 77, how many coins of each denomination does he have?

Solution: Let the number of five-rupee coins that Bansi has be x. Then the number of two-rupee coins he has is 3 times x or $3x$.

The amount Bansi has:

(i) from 5 rupee coins, ₹ $5 \times x = ₹ 5x$

(ii) from 2 rupee coins, ₹ $2 \times 3x = ₹ 6x$

Hence the total money he has = ₹ $11x$

But this is given to be ₹ 77; therefore,

$11x = 77$

or $x = \frac{77}{11} = 7$

Thus, number of five-rupee coins = $x = 7$

and number of two-rupee coins = $3x = 21$ (solution)

(You can check that the total money with Bansi is ₹ 77.)

Example 9: The sum of three consecutive multiples of 11 is 363. Find these multiples.

Solution: If x is a multiple of 11, the next multiple is $x + 11$. The next to this is $x + 11 + 11$ or $x + 22$. So we can take three consecutive multiples of 11 as x, $x + 11$ and $x + 22$.

It is given that the sum of these consecutive multiples of 11 is 363. This will give the following equation:

$x + (x + 11) + (x + 22) = 363$

or $x + x + 11 + x + 22 = 363$

or $3x + 33 = 363$

or $3x = 363 - 33$

or $3x = 330$

Alternatively, we may think of the multiple of 11 immediately before x. This is $(x - 11)$. Therefore, we may take three consecutive multiples of 11 as $x - 11$, x, $x + 11$.

In this case we arrive at the equation

$(x - 11) + x + (x + 11) = 363$

or $3x = 363$

Express the equations stepwise in simple words for better understanding as in the example as given below:

Symbols	***Words***
x+3	*Solve for x*
x+3-3=22-3	*Subtract 3 from both sides of the equation*
x=19	*x equals 19*

Adapting a Sample Chapter

Subject: Science, Class – VIII (Science)

Sample pages from Chapter 13 "Sound" with Suggestions

CHAPTER 13

Sound

How do you come to know that a 'period' is over in your school? You come to know easily that someone is at your door when he knocks or you hear the sound of the doorbell. Most of the time you can make out that someone is approaching you by just hearing the foot steps.

You might have played a game called hide and seek. In this game a person is blind-folded and has to catch the remaining players. How is the blind-folded person able to guess which player is closest to her?

Sound plays an important role in our lives. It helps us to communicate with one another. We hear a variety of sounds in our surroundings.

Make a list of sounds you hear in your surroundings.

In the music room of your school you hear the sounds produced by musical instruments like flute, *tabla*, harmonium, etc. (Fig. 13.1).

How is sound produced? How does it travel from one place to another? How do we hear sound? Why are some sounds louder than others? We shall discuss such questions in this chapter.

Introduce the concept of 'sound' by making children hear some pre-recorded sounds like sounds of birds, animals, mobile phone etc. Background noise needs to be eliminated to make them hear. Some children can understand sound by feeling the vibrations produced by sound. The source of sound should be kept near the child.

Also explain through facial expression and real demonstration like clapping etc.

Provide actual experiences to the child like making him/her rub two objects against each other and feeling the sound/ vibration thus produced. They can do simple activities like hitting the duster on the blackboard etc.

Show various sources of sound through visual mode like captioned pictures, flash cards and videos.

13.1 Sound is Produced by a Vibrating Body

Touch the school bell when not in use. What do you feel? Then touch it when producing sound. Can you feel it vibrating?

Activity 13.1

Take a metal plate (or a shallow pan). Hang it at a convenient place in such a way that it does not touch any wall. Now strike it with a stick (Fig. 13.2). Touch the plate or pan gently with your finger. Do you feel the vibrations?

Fig. 13.2 : Striking a pan

Again strike the plate with the stick

Activity 13.2

Take a rubber band. Put it around the longer side of a pencil box (Fig. 13.3). Insert two pencils between the box and the stretched rubber. Now, pluck the rubber band somewhere in the middle. Do you hear any sound? Does the band vibrate?

Fig. 13.3 : Plucking the rubber band

As you learnt in Class VII the to and fro or back and forth motion of an object is called **vibration**. When a tightly stretched band is plucked, it vibrates and produces sound. When it stops vibrating, it does not produce any sound.

Activity 13.3

Take a metal dish. Pour water in it. Strike it at its edge with a spoon (Fig. 13.4). Do you hear a sound? Again strike the dish and then touch it. Can you feel the dish vibrating? Strike the dish again. Look at the surface of water. Do you

Sound Produced by a Vibrating Body

Demonstrate by making the child hold a vibrating mobile phone and feeling the sound. OR

Concept can also be taught by simple activities like rotating a Firki tied to thread. The child can be made to feel the rotating Firki and experience the vibration and sound. OR

Drums if used in the morning prayer of schools can be touched to feel the vibrations. OR

Make students participate in an activity. Take a tuning fork and a bowl of water (filled 2 inches or so). Strike the tuning fork against a book and dip the fork in the pan or bowl of water. Sound vibrations cause ripples in the water.

Activity 13.5

Take 6-8 bowls or tumblers. Fill them with water up to different levels, increasing gradually from one end to the other. Now take a pencil and strike the bowls gently. Strike all of them in succession. You will hear pleasant sounds. This is your *jaltrang* (Fig.13.7).

Fig. 13.7 : *Jaltrang*

When we pluck the string of an instrument, like the sitar, the sound that we hear is not only that of the string. The whole instrument is forced to vibrate, and it is the sound of the vibration of the instrument that we hear...

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When we speak, does any part of our body vibrate?

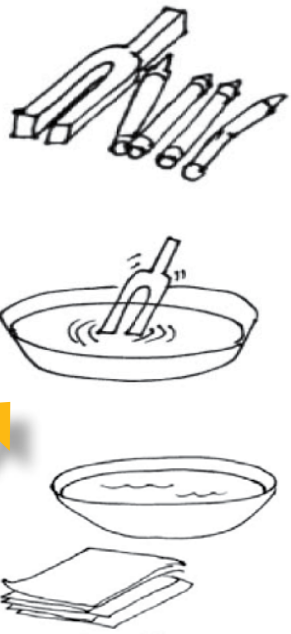
13.2 Sound Produced by Humans

Speak loudly for a while or sing a song, or buzz like a bee. Put your hand on your throat as shown in Fig. 13.8. Do you feel any vibrations?

In humans, the sound is produced by the **voice box** or the **larynx**. Put your fingers on the throat and find a hard bump that seems to move when you swallow. This part of the body is known as the voice box. It is at the upper end of the **windpipe**. Two **vocal cords,** are stretched across the voice box or larynx in such a way that it leaves a narrow slit between them for the passage of air (Fig.13.8).

Fig. 13.8 : *Voice box in humans*

When the lungs force air through the



Sound Produced by Humans

This can be taught through simple activities like children seeing and touching / feeling with finger on the front of the their throat, close to their "voice box," (middle of the throat), being careful not to press too hard.

Audible and Inaudible Sounds

Use demonstration and facial expressions like closing the ears with palms to teach the concept.

Noise and Music

Show picture cards of various musical instruments. It can also be demonstrated by taking the children to the music room of the school and playing instruments like Tabla, Harmonium and Flute.

v-pitched sound. On the othe
l, a whistle has a high f quency
therefore, produces a s und of
r pitch (Fig. 13.18). A bir makes
h-pitched sound whereas a lion
w-pitched roar. Howe er, the
of a is very loud wh e the
d of the b d is quite feeble.
ery day y hear the vo es of
en and adu s. Do you fi any
ence in their ices? Can y say
he frequency the voice of a hild
her than that an adult? Us ally
oice of a wo n has a h her
ncy and is sh ler than tha of a

Audible and Inaudible Sounds

We know that we need a vibrating b y for the production of sound. Can e the sound of all vibrating bodie he fact is that sounds of frequenci han about 20 vibrations per secon

z) cannot be detected by the human Such sounds are called inaudible. e higher side, sounds of frequencies r than about 20,000 vibrations pe d (20 kHz) are also not audible t human ear. Thus, for human ea range of audible frequencies ly from 20 to 20,000 Hz.

ne animals can hear sounds o quencies higher than 20,000 Hz s have this ability. The police us frequency whistles which dogs ca r but humans cannot.
The ultrasound equipment, famil is for investigating and track y medical problems, works uencies higher than 20,000 Hz

13.7 Noise and Music

We hear different types of sounds around us. Is the sound always pleasing? Does a sound sometimes cause discomfort to you? Some sounds are pleasant to the ear, whereas some are not.

Suppose construction work is going on in your neighbourhood. Are the sounds coming from the construction site pleasing? Do you enjoy the sounds produced by horns of buses and trucks? Such unpleasant sounds are called **noise**. In a classroom, if all the students speak together, what would the sound produced be called?

n the other hand you enjoy sounds m musical instruments. **Musical und** is one which is pleasing to the r. Sound produced by a harmonium a musical sound. The string of a sitar lso gives out a musical sound. But, if musical sound becomes too loud, would it remain melodious?

13.8 Noise Pollution

You already know about a pollution. Presence of unwanted ses and particles in air is called ai pollution. Similarly, presence of ex ssive or unwanted sounds in the en ronment is called noise pollution. Ca you list some sources of noise pollutio ? Major causes of noise pollution are s nds of vehicles, explosions including rsting of crackers, machines, loudspea rs etc. What sources in the home may ad to noise? Television and transisto adio at high volumes, some ki hen appliances, desert coolers, air conditioners, all contribute to ise pollution.

Sc E

Noise

Noise can be demonstrated by exposing the child to the sound of motor bike, bus, tractor etc.

The harmful effect of noise can be demonstrated through facial expression. It can also be taught through dramatisation.

Noise Pollution can be explained through flash cards or showing objects/ activities like bursting of crackers, high volume music, roaring sound of an aeroplane / ship.

opening between your hands. Indicate to your friend to give a ring again. Listen to the ring while sucking air from the tumbler.

Does the sound become fainter as you suck air?

Remove the tumbler from your mouth. Does the sound become loud again?

Can you think of an explanation? Is it possible that the decreasing amount of air in the tumbler had something to do with decreasing **loudness** of the ring?

Indeed, if you had been able to suck all the air in the tumbler, the sound would stop completely. Actually, sound needs a medium to travel. When air has been removed completely from a vessel, it is said that there is a **vacuum** in the vessel. The sound cannot travel through a vacuum.

Does sound travel in liquids? Let us find out.

Activity 13.8

Take a bucket or a bathtub. Fill it with clean water. Take a small bell in one hand. Shake this bell inside the water to produce sound. Make sure that the bell does not touch the body of the bucket or the tub.

Fig. 13.11 : Sound travelling through water

Place your ear gently on the water surface (Fig. 13.11). *(Be careful ; the water should not enter in your ear.)* Can you hear the sound of the bell? Does it indicate that sound can travel through liquids?

Oh ! That is how whales and dolphins might be communicating under water.

Let us find out if sound can travel through solids also.

Activity 13.9

Take a metre scale or a long metal rod and hold its one end to your ear. Ask your friend to gently scratch or tap at the other end of the scale (Fig. 13.12).

Fig. 13.12 : Sound travelling through a metre scale

Can you hear the sound of the scratching? Ask your friends around you if they were able to hear the same sound?

Loudness and Pitch

Loudness of sound from various sources like breathing, soft whisper, conversation, busy traffic (along with picture) can be explained through facial expression and the figures can be expressed through finger counting.

Harms of Noise Pollution

This can be taught to the child through flash card and facial expression. Effects like lack of sleep, headache, deafness can be taught through signs and demonstration.

What are the Harms of Noise Pollution?

Do you know that presence of excessive noise in the surroundings may cause many health related problems. Lack of sleep, hypertension (high blood-pressure), anxiety and many more health disorders may be caused by noise pollution. A person who is exposed to a loud sound continuously may get temporary or even permanent impairment of hearing.

Measures to Limit Noise Pollution

To control noise, we must control the sources of noise. How can this be achieved? For this, silencing devices must be installed in air craft engines, transport vehicles, industrial machines and home appliances.

How can the noise pollution be controlled in a residential area?

All noisy operations must be conducted away from any residential area. Noise producing industries should be set up away from such areas. Use of automobile horns should be minimised. TV and music systems should be run at low volumes. Trees must be planted along the roads and around buildings to cut down on the sounds reaching the residents, thus reducing the harmful effects of noise pollution.

Hearing Impairment

Total hearing impairment, which is rare, is usually from birth itself. Partial disability is generally the result of a disease, injury or age. Children with impaired hearing need special care. By learning sign language, such children can communicate effectively. Because speech develops as the direct result of hearing, a child with a hearing loss may have defective speech also. Technological devices for the hearing-impaired have made it possible for such persons to improve their quality of life. Society can do much to improve the living environment for the hearing-impaired and help them lead normal lives.

Measures to Limit Noise Pollution

This can be taught through flash cards/ pictures with captions like planting of trees near buildings etc.

Silencing devices

The concept of silencer can be taught by demonstrating how noise can be controlled by actions like keeping hands on the mouth, by showing videos, pictures and flash cards of shutting off the vehicle when in traffic etc.

EXERCISES

3. In the following statements, tick 'T' against those which are true, and 'F' against those which are false.
   (a) Sound cannot travel in vacuum. (T/F)
   (b) The number of oscillations per second of a vibrating object is called its time period. (T/F)
   (c) If the amplitude of vibration is large, sound is feeble. (T/F)
   (d) For human ears, the audible range is 20 Hz to 20,000 Hz. (T/F)
   (e) The lower the frequency of vibration, the higher is the pitch. (T/F)
   (f) Unwanted or unpleasant sound is termed as music. (T/F)
   (g) Noise pollution may cause partial hearing impairment. (T/F)
4. Fill in the blanks with suitable words.
   (a) Time taken by an object to complete one oscillation is called _____.
   (b) Loudness is determined by the _____ of vibration.
   (c) The unit of frequency is _____
   (d) Unwanted sound is called _____ .
   (e) Shrillness of a sound is determined by the _____ of vibration.
5. A pendulum oscillates 40 times in 4 seconds. Find its time period and frequency.
6. The sound from a mosquito is produced when it vibrates its wings at an average rate of 500 vibrations per second. What is the time period of the vibration?
7. Identify the part which vibrates to produce sound in the following instruments.
   (a) *Dholak* (b) *Sitar* (c) Flute
8. What is the difference betwe[en] noise and music? Can music become noise sometimes?
9. List sources of noise pollut[ion] in your surroundings.
10. Explain in what way nois[e] pollution is harmful to human.
11. Your parents are going t[o] buy a house. They have been offered one on the roadside and another [th]ree lanes away from the roadside. Which house would you suggest yo[ur] parents should buy? Explain your answer.
12. Sketch larynx and e[x]plain its function in your own words.
13. Lightning and thu[n]der take place in the sky at the same time and at the same distance fr[om] us. Lightning is seen earlier and thunder is heard later. Can you ex[p]lain why?

Use Short Answer Questions like

What is audible/inaudible sound?

or

Fill in the blanks like: Frequency is measured in_____ (dB/Hz)

instead of long/descriptive answer questions.

Cognitive Impairments, Intellectual Disabilities

In the first section, we mentioned that children with disabilities, where brain is involved in the disability condition, are more likely to have educational and intellectual problems. It has also been seen that many of the learning needs experienced and the development of the child may be affected by the cultural background, stimulation from the family members, attendance at school and motivation to study.

We all know that rarely would there be a curriculum that is equally accessible to all students, including children with cognitive impairments, intellectual disabilities. For this reason, teachers need to learn how to adapt and use a number of strategies based on the learning needs of students. Many of these strategies would benefit all students in the class and therefore the notion of extra burden, extra effort is not true in most cases.

Impairments in cognitive, intellectual functioning may reflect in one or more of the following areas :

- Visual and/or auditory perceptions
- Meta-cognition (knowing about one's own thinking and learning- what skills, strategies are needed to plan and carry out tasks)
- Retaining information[32] and memory – for example, transferring knowledge from one task to another
- Information Processing – attending to information from different senses
- General Intellect (Intelligence)
- Physical activity (overactivity or underactivity, coordination, balancing, drawing, discriminating between directions and positions – right and left, up and down etc.)
- Attention and concentration – short attention span, distractions, impulsivity
- Eye hand coordination, for example, in geometry, handwriting and diagrams etc.
- Language (reading, writing, spellings, speaking) and understanding Mathematics
- Exposure to experiences (limited experiences)
- Ability to change according to situation
- Expression of needs and emotions
- Thinking , reasoning, problem solving and understanding
- Social activity and problems of self-regulation (for example, tantrums and lack of understanding of social rules/inhibitions, peer relationships, not understanding the meaning of what people say)
- Communication skills [33]
- Over or under sensitive to sounds, smells and touch[34]

32 *Source: http://www.siskin.org/downloads/FactsonCognitiveImpairment.pdf*
33 *Expressing information that is learnt and retained in a particular manner can be difficult.*
34 *A person may experience difficulties in only one or two or more areas of cognitive functioning.*

LANGUAGE

Specific Needs related to Language[35]

- Oral language (listening, expressing ideas and/or speaking) and articulation (ability to speak fluently and coherently)
- Reading (including decoding, phonetic knowledge and word recognition); (The student may skip words, lose place, mistake one word for another etc.)
- Eye hand coordination and writing (illegible handwriting, frequent spelling errors)
- Organizing thoughts, making revisions etc., pronouncing words and/or sequencing a story
- Language comprehension (new vocabulary, sentence structure, words with different meanings and concepts) especially when presented rapidly, leading to difficulty in taking class notes
- Understanding figurative language- idioms, metaphors, similes etc.

Tips and Strategies for Inclusion of Children with Cognitive Impairments, Intellectual Disabilities in Language Teaching and Learning

- Use different styles and modes of presentation (multisensory) - visual, auditory, kinaesthetic etc.
- Simplify paragraphs to reduce complexity.
- Illustrate ideas and new vocabulary and make content attractive through use of visual aids (videos, movies) and other strategies, for example, pictures, flash cards, hand puppets, use of real life experiences, dramatisation, enacting, stories, real objects and supplementary material.
- Present background information related to the concept for better understanding.
    - Enact poem while it is being read. Recite it with expressions.
    - Frame questions for different sections of the lesson like introduction, assessment etc.
    - Make use of paired reading to promote fluency in reading.
    - Give word meanings or synonyms for difficult words within a bracket right beside the word, and highlight abstract or other words that need to be explained.

35 *Comprehending new words, following long sentences or understanding how they are arranged grammatically and interpreting the new ideas that emerge during learning process is a challenge. The child faces hurdles in interpreting the meaning of words; he/she may lack awareness regarding the different sounds of letters and letter combinations.*

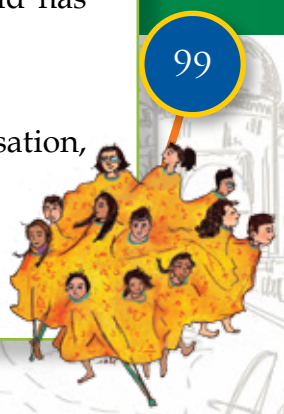
Social Science

Specific Needs related to Social Sciences

- Accessing written work, illustrations, charts, graphs and maps (especially for students with cognitive processing problems – visual spatial/visual processing / perceptual)
- Extracting relevant information from bulk information. Text heavy subjects like History are a challenge for students with reading difficulties
- Remembering the sequence of events and connecting them
- Understanding and interpreting abstract concepts
- Generalisation and relating information in the textbooks with the environment or society

Tips and Strategies for Inclusion of Children with Cognitive Impairments, Intellectual Disabilities in Social Science Teaching and Learning

- Make use of multisensory inputs.
- All examples given with pictures in the textbook can be narrated (using flash cards, if required).
- While teaching the chapters, use lot of graphic organisers, timelines and tables as this will make the task simpler.
- Maps should be enlarged and colour coded.
- The text, along with pictures, can be enlarged, made into pictures cards and presented sequentially as a story. Sequencing makes it easier to connect information.
- Asking relevant questions frequently to check how much the child has learnt as it helps in assimilating information[36].
- Provide concrete inputs like globes, models etc.
- Teach and evaluate in different ways, for example, through dramatisation, field trips, real life examples, project work etc.
- Highlight all the important phrases and information.
- Pictures should be labelled and captioned.



36 *Having questions stating What, Where, When first, and then move on to How and Why questions.*

Mathematics

Specific Needs related to Mathematics[37]

- Sequencing, step wise problem solving and difficulty in place value
- Mathematical calculations (computations), number reversals, copying problems etc
- Confusion in operational symbols, such as + for x, and difficulty in recalling sequence of operations
- Identifying different shapes in geometry and directionality
- Abstract concepts like in Algebra and integers etc.
- Comprehension of word problems

Tips and Strategies for Inclusion of Children with Cognitive Impairments, Intellectual Disabilities in Mathematics Teaching and Learning

- Begin with concrete examples and then move on to abstract concepts. Use a picture or sequence of pictures to demonstrate understanding of a concept or a process.
- Visual representations including manipulatives are helpful in understanding abstract mathematical concepts.
- Always go step by step and provide guidance/feedback at each step while solving a problem.
- Make use of ICT as it has the benefit of multisensory approach and assistive tools, such as calculators, computers, visual aids or talking devices, to assist individuals with difficulties in math acquisition.
- Make use of mnemonic devices[38], flashcards, supplementary/drill activities and other strategies to memorize formulas, sequences and order of operations.
- Focus energy on logic and reasoning while teaching word problems, rather than on calculation, if required.
- Encourage them to explain verbally the way they have solved the problem.
- Make use of ICT - auditory, visual, interactive etc.
- Use real life contexts/examples for teaching Mathematics like games, sports (keeping score, following directions), visits and even cooking (measuring, matching quantity).
- Follow a well-defined teaching sequence with a pace based on the student's needs. Teacher can find out what the student already knows and build his/her teaching accordingly. For example, the teaching process will involve a strategy like scaffolding (giving support during the learning process) as students build deep understanding.

37 Visual processing, visual memory, and visual-spatial relationships all impact math proficiency in that they are threads in the fabric of conceptual understanding and procedural fluency (Kilpatrick et al., 2001). Basic Mathematical facts/concepts may not be mastered like others if these children have been deprived of quality mathematics teaching in earlier classes.

38 Mnemonic devices are strategies to improve a person's memory. For example: order of Maths operations of 'Parentheses, Exponents, Multiply, Divide, Add and Subtract' can be remembered as 'Please Excuse My Dear Aunt Salma'

Science

Specific Needs related to Science

- Understanding the technical language of Science
- Drawing meaningful linkages/relationships between concepts (for example, between pressure and force)
- Planning, organizing, sequencing and generalising
- Understanding abstract concepts
- Conducting or handling science experiments

Tips and Strategies for Inclusion of Children with Cognitive Impairments, Intellectual Disabilities in Science Teaching and Learning

- Science topics can be taught through class projects, experiments, examples etc. Activities can be conducted through multisensory modes before explaining any theory and concept.
- Peer support can be used wherever a figure or table has to be drawn. Peer partner can draw with a carbon paper (for copying).
- Highlight and underline the key concepts.
- Encourage exploration through manipulation of materials like rulers, measuring tapes etc.
- Provide extra time to complete an experiment and understand a concept.
- Always provide proper guidelines to arrange the task in a planned way. Make use of visual aids, graphic organiser and explain the steps of experiments and assignment repetitively till the child learns.
- Sequence map with visual cues can be provided to the students to understand the sequence.
- Connect learning with real life experiences.

A predictable process assists the brain in channeling stimuli into long-term learning. When teachers present information in a sequence that supports this process, it is much easier for children to learn (Sousa 2006). To help children focus on a lesson, begin by asking them a relevant question or showing them intriguing photos. When presenting the actual content of the lesson, show children how the new information is similar to other information familiar to them. Point out any patterns that occur in the new information. Allow children to practise using new information, through hands-on activities when possible. Finally, encourage children to think about how they will use the new information and to ask themselves, How is this information relevant to my life?

Using Brain-Based Teaching Strategies to Create Supportive Early Childhood Environments That Address Learning Standards [39].

Some Examples

English

While teaching Chapter 8 : "A Game of Chance" from the book Honeysuckle (Class VI), the following adaptations would help: the concept of fair can be taught through visit to a fair, discussions on the fair, showing films and pictures. Game of Chance can be explained by playing games where chance plays a crucial role, for example, dice, cards and tambola etc. Narrating the story in simple language with pictures, key words, flash cards with simple sentences, sequencing the cards to highlight the order of events, demonstration of the game, giving examples like birthdays, wedding for explaining the word occasion. Posing questions after each paragraph and asking students to frame questions and answers in both oral and recorded form help.

Social Sciences

The concept of Destruction of Temples from the chapter on 'Rulers and Buildings'(Class VII) can be explained by dramatisation or role play, use of actual photographs with clear labels (for example, showing picture with an arrow pointing to the balcony), using bulleted points for explaining abstract concepts, practical demonstrations using blocks, mud, wood to show how structures were built, asking questions, demonstrating through maps (by

39 *Pam Schiller,& Clarissa A. Willis (2008). Using Brain- based teaching strategies to create supportive early childhood enviornments that address learning standards. Retrived from: http://www.naeyc.org/files/yc/file/200807/39BTJ PrimaryInterest.pdf*

putting monuments on maps) and stories, creating time lines, etc.

In the chapter 'Women Change the World' (Class VII Social and Political Life), Women's Movement can be taught using the following strategies;

- Group work by making children research books, newspapers and other materials on specific topics;
- Mind maps, graphic representations for understanding different Women's Movements;
- Role play followed by asking questions and discussions.

Mathematics

1) Solving equations (Mathematics, Class VI) can be made simpler and easier by using pictures/visual effects. For example, in Algebra we can solve the equation x + 2 = 3 by using boxes/cubes ( )

x + 2 = 3

□ + □ □ = □ □ □

2) The concept of Integers (Mathematics, Class VI) can be taught through playway activity method and role play. Ask a child to play a shopkeeper and another child to play the role of a customer. The account book maintained by the shopkeeper will help in noting the due amount. An interest amount will be added if the dues are not paid on time. (explain concepts of +, – and =).

3) The concept of variables in Algebra can be taught through real life examples, for example, consider two students of class, and ask their ages - on finding that the age of one student is one year more than the other we can make a table/chart like the following , depicting ages of the two students :

Year	Name	2014	2015	2016	2017		
	Radha	11	12	13	14	----------	X
	Sartia	12	13	14	15	----------	X+1

So if Radha's age is x years, (here 'x' is a variable) then Sarita's age will be x+1 yrs – it can be explained that variation of age is same. So by knowing Radha's age, we can find Sarita's age.

Science

1) For teaching the chapter Light, Shadow and Reflections in the Science textbook of Class VI the following adaptations can be made:
   - The concept and relevance of light can be introduced through simple activities like, making children close their eyes and then open, or by turning off the lights or closing the windows. Asking questions like whether they could see while their eyes were closed? Why could they not see? Could they read while the lights were off? etc.
   - Using flashcards to show incident ray and reflected ray. A diagram of the activity with spaces for labelling, and numbering the spaces to be labelled can be used so that the child can also practise by filling in appropriate terms in appropriate spaces.
   - Encourage exploration through manipulation of materials, for example, you can move a comb backward or forward, and show the child how the angle of incidence and reflection change.
   - Concepts like Transparent, Opaque and Transluscent can be taught through examples like light traveling through barriers, actual experiences, materials and pictures.
   - Shadows can be taught through real experiences, pictures with labels explaining different components of shadow formation.

Facilitating Participation of Children with Cognitive Impairments and Intellectual Disabilities in Inclusive Classrooms

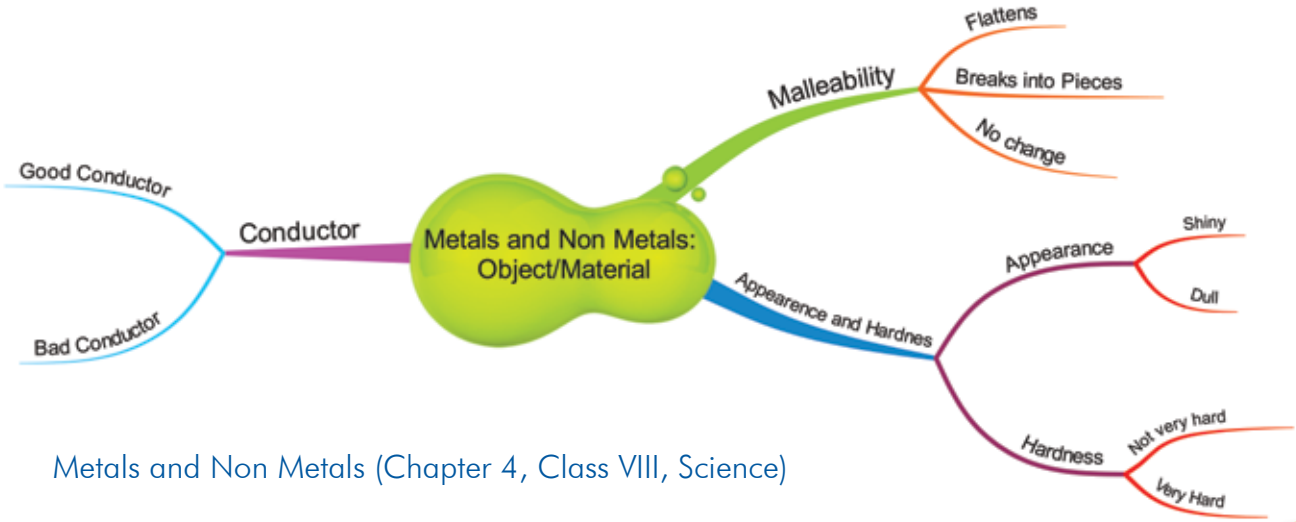
- Use Multisensory approach covering all types of learning styles- Visual, Auditory, Kinaesthetic, Tactile (VAKT).
- Make use of Graphic organiser[40], Multiple Choice questions etc. for teaching and evaluation.
- Provide alternative modes of expression and evaluation like drawings, models, presentation.
- Use of direct teaching (teaching by teachers) strategy[41].

40 Mind map is a powerful graphic technique created around a single concept. It helps the student to understand concepts through drawing new ideas and building connections between these ideas through visual organizations.

41 Explicit teaching, also called Direct teaching, which involves topics, concepts and contents, broken down into small parts and taught as part of the whole, helps all children, especially children with cognitive problems. Using strategies like explanation, demonstration and practice are also helpful.

- Avoid use of red pens for correction as it is often seen as a form of discouragement.
- Modify curriculum according to the needs of the students.
- Volume reduction: Give shorter assignments, if required.
- Reduce complexity by making simpler assignments/test papers.
- Give extra time for assignments.
- Allow provison of Reader and Scribe (writer).
- Provide choice of subjects (some subjects may be difficult for some students to handle, so they may be given a choice of selecting the subjects according to their needs).
- Provide opportunities for using assistive devices like computers, calculators, written instructions etc.
- Maintain daily routines and schedule of activities, providing outline of classroom objectives, informing in advance if there is change in the routine.
- Tap students' interests and motivate.
- Encourage peer support and use cooperative learning strategies.

Mind Map: An example of Graphic organiser.



Metals and Non Metals (Chapter 4, Class VIII, Science)

A Mind Map is a powerful graphic technique which provides a universal key to unlock the potential of the brain. It harnesses the full range of cortical skills — word, image, number, logic, rhythm, colour and spatial awareness — in a single, uniquely powerful manner. In so doing, it gives you freedom to roam the infinite expanses of your brain. The Mind Map can be applied to every aspect of life where improved learning and clearer thinking will enhance human performance.[42]

42 *The reference picture has been made using the trial software at Tony Buzan's Mind Mapping Illustration; the web address is tonybuzan.com*

ADAPTING A SAMPLE CHAPTER

SUBJECT: ENGLISH, CLASS – VIII (HONEYDEW)

Sample pages from Poem "Macavity: The Mystery Cat" with Suggestions:

Role play, dramatization, collaborative learning and peer support can be used as teaching strategies. Make use of concrete objects like actual models and pictures.

Use plenty of visual support. Create a life sized model of Macavity using art and craft.

Break the poem into smaller units/portions for discussion and ask specific questions to check the child's understanding.

Macavity : The Mystery Cat

Do you have a pet cat? Have you ever noticed anything mysterious about it? It is not easy to say whether every cat is a mystery, but Macavity is one, for sure. What is it that makes him a perfect mystery cat? Read the poem and find out.

Macavity's a Mystery Cat: he's called the Hidden Paw —
For he's the master criminal who can defy the Law.
He's the bafflement of Scotland Yard, the Flying Squad's despair:
For when they reach the scene of crime — Macavity's not there!

Macavity, Macavity, there's no one like Macavity,
He's broken every human law, he breaks the law of gravity.
His powers of levitation would make a fakir stare,
And when you reach the scene of crime — Macavity's not there!
You may seek him in the basement, you may look up in the air —
But I tell you once and once again, Macavity's not there!

Provide definitions in advance for difficult words by making an active word wall with their meanings. For example,
Bafflement – Confused
Levitation – Rise up in the air through/by magical powers.
Ginger – Tricky
Fiend – Devil
Depravity – Dishonesty
Alibi – A claim that one was elsewhere during the act.
Napoleon of Crime – the dictating leader of crime
Scotland Yard and the Flying Squad – British Detective agencies.
Highlight all the abstract and difficult words.

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You may seek him in th basement, you may look up in the air —
But I tell you once and nce again, Macavity's not there!

Macavity's a ginger cat he's ve tall and thin;
You would know him
his eyes are sunken in
His brow is deeply line
head is highly domed;

Simplify each line of the stanza, by giving the meaning along with visual support; for example, to explain the line "he's called the Hidden Paw" give the meaning first (feet of a four legged animal) followed by the picture of a paw.

Words can be illustrated by using creative styles; for example, the term 'Bafflement' can be explained by showing the picture of a man searching for something but, since he is unable to find it he looks confused.

Brainstorm the meaning and promote its usage in simple sentences.

Explain the abstract concepts in the poem through illustrations; for example, "His powers of levitation would make a fakir stare," can be taught by showing the picture of a cat levitating and a fakir staring at him, his eyes popping out.

His coat is dusty from neglect, his whiskers are uncombed.
He sways his head from side to side, with movements like a snake;
And when you think he's half asleep, he's always wide awake.

Macavity, Macavity, there's no one like Macavity,
For he's a fiend in feline shape, a monster of depravity.
You may meet him in a by-street, you may see him in the square —
But when a crime's discovered, then Macavity's not there!

T.S. ELIOT

Summary of the poem to be included at the end of the poem.

...e London police force
...diers ready to move into action quickly
...upport

depravity: moral corruption

working with the poem

1. Read the first stanza and think.
   (i) Is Macavity a cat really?
   (ii) If not, who can Macavity be?

...sentences.
...s one who _____
...s baffled because _____
...because Macavity mo... much faster than them.
...walk on a cloud withou...oming through".
(Jules Verne)
...reaking in the light of the co...ment above?

Macavity ...he Mystery Cat 51

All figurative language used in the poem can be revised (to check the understanding of the child) by filling a graphic organiser in which children can explain the meaning that they already know and can also give an example.

Figurative Language	*Definition*	*Example*
Simile	*a comparison that uses like or as*	*as white as snow*

Evaluation

Create a comic book or comic strip that tells the story of Macavity.

Enact the poem

Multiple choice questions

Matching meaning to words or word pictures/ figures of speech.

Adapting a Sample Chapter

Subject: Social Science, Class – VIII (Our Pasts – III)

Sample pages from Chapter 5 "When People Rebel" with Suggestions

5 When People Rebel
1857 and After

Fig. 1 – Sepoys c… gather forces for … spread across th… India in 1857

Show a movie or create a story related to the content of the chapter before introducing the chapter. For example, the Hindi movie called Mangal Pandey can be shown. It was based on the 1857 revolt and can be used to introduce the theme of the chapter.

Policies and the People

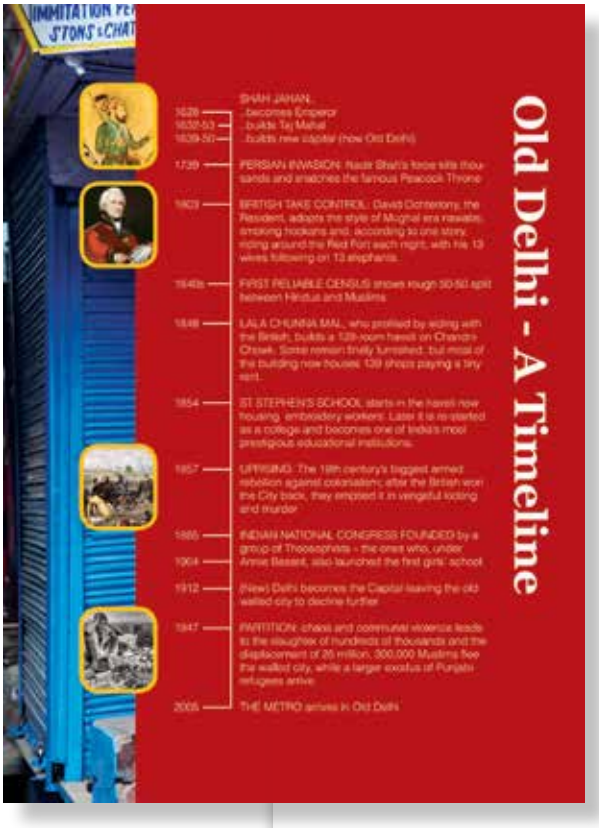
In the previous chapters you looked at the policies of the East India Company and the effect they had on different people. Kings, queens, peasants, landlords, tribals, soldiers were all affected in different ways. You have also seen how people resist policies and actions that harm their interests or go against their sentiments.

Nawabs lose their power

Since the mid-eighteenth century, nawabs and rajas had seen their power erode. They had gradually lost their authority and honour. Residents had been stationed in many courts, the freedom of the rulers reduced, their armed forces disbanded, and their revenues and territories taken away by stages.

Many ruling families tried to negotiate with the Company to protect their interests. For example, Rani Lakshmibai of Jhansi wanted the C… her adopted son as the heir to th… death of her husband. Nana Saheb…

Provide graphic presentation of the summary of each sub-section before the narrative; for example, illustration of how "Nawabs lost their power."



Sample of a timeline published in the brochure Street Connections: Old Delhi Walk (http://www.streetconnections.co.uk)

Peshwa Baji Rao II, pleaded that he be given his father's pension when the latter died. However, the Company, confident of its superiority and military powers, turned down these pleas.

Awadh was one of the last territories to be annexed. In 1801, a subsidiary alliance was imposed on Awadh, and in 1856 it was taken over. Governor-General Dalhousie declared that the territory was being misgoverned and British rule was needed to ensure proper administration.

The Company even began to plan how to bring the Mughal dynasty to an end. The name of the Mughal king was removed from the coins minted by the Company. In 1849, Governor-General Dalhousie announced that after the death of Bahadur Shah Zafar, the family of the king would be shifted out of the Red Fort and given another place in Delhi to reside in. In 1856, Governor-General Canning decided that Bahadur Shah Zafar would be the last Mughal king and after his death none of his descendants would be recognised as kings – they would just be called princes.

The peasants and the sepoys

In the countryside peasants and zamindars resented the high taxes and the rigid methods of revenue collection. Many failed to pay back their loans to the moneylenders and gradually lost the lands they had tilled for generations.

The Indian sepoys in the employ of the Company also had reasons for discontent. They were unhappy about their pay, allowances and conditions of service. Some of the new rules, moreover, violated their religious sensibilities and beliefs. Did you know that in those days many people in the country believed that if they crossed the sea they would lose their religion and caste? So when in 1824 the sepoys were told to go to Burma by the sea route to fight for the Company, they refused to follow the order, though they agreed to go by the land route. They were severely punished, and since the issue did not die down, in 1856 the Company passed a new law which stated that every new person who took up employment in the Company's army had to agree to serve overseas if required.

Sepoys also reacted to what was happening in the countryside. Many of them were peasants and had families living in the villages. So the anger of the peasants quickly spread among the sepoys.

Activity

Imagine you are a sepoy in the Company army, advising your nephew not to take employment in the army. What reasons would you give?

Timeline in the chapter to be given in the beginning, to make sequencing and retaining of the content easy. Example:

1801 – Subsidiary alliance imposed on Awadh.

1849 – Governor General Dalhousie announces that after the death of Bahadur Shah Zafar, the family of the king would be shifted out of Red Fort and given another place in Delhi to reside in.

1856 – Governor General Canning decided that Bahadur Shah Zafar would be the last Mughal King.

1856 – Company passes a new law.

Responses to reforms

The British believed that Indian society had to be reforme[d]. Laws were passed to stop the practice of s[ati] and to encourage the remarriage of widows. [E]nglish-language education was actively pro[m]oted. After 1830, the Company allowed Chi[r]stian missionaries to function freely in its [d]omain and even own land and property. In [1]850, a new law was passed to make convers[i]on to Christianity easier. This law allowed an [I]ndian who had converted to Christianity to [i]nherit the property of his ancestors. Many [I]ndians began to feel that the British were dest[r]oying their religion, their social customs and [t]heir traditional way of life.

There were of cou[r]se other Indians who wanted to change existi[n]g social practices. You will read about these re[f]ormers and reform movements in Chapter 7.

Fig. 2 – Sepoys exchange r[u]mours and rumours in the bazaars [o]f India

Through the Eyes of the P[e]ople

To get a glimpse of what people were t[h]inking those days about British rule, study Sources 1 and 2.

Source 1

The list of eighty-four rules

Given here are excerpts from the book *Majha Pravaas*, written by Vishnubhatt Godse, a Brahman from a village in Maharashtra. He and his uncle had set out to attend a *yajna* being organised in Mathura. Vishnubhatt writes that they met some sepoys on the way who told them that they should not proceed on the journey because a massive upheaval was going to break out in three days. The sepoys said:

> **the English were determined to wipe out the religions of the Hindus and the Muslims … they had made a list of eighty-four rules and announced these in a gathering of all big kings and princes in Calcutta. They said that the kings refused to accept these rules and warned the English of dire consequences and massive upheaval if these are implemented … that the kings all returned to their capitals in great anger … all the big people began making plans. A date was fixed for the war of religion and the secret plan had been circulated from the cantonment in Meerut by letters sent to different cantonments.**

Vishnubhatt Godse, Majha Pravaas, *pp. 23-24.*

Highlight the important phrases in the text. It will help the students to extract relevant information from the bulk of information.

Source 2 contd.

It chanced that about this time the Sarkar sent parties of men from each regiment to different garrisons for instructions in the use of the new rifle. These men performed the new drill for some time until a report got about by some means or the other, that the cartridges used for these new rifles were greased with the fat of cows and pigs. The men from our regiment wrote to others in the regiment telling them about this, and there was soon excitement in every regiment. Some men pointed out that in forty years' service nothing had ever been done by the Sarkar to insult their religion, but as I have already mentioned the sepoys' minds had been inflamed by the seizure of Oudh. Interested parties were quick to point out that the great aim of the English was to turn us all into Christians, and they had therefore introduced the cartridge in order to bring this about, since both Mahommedans and Hindus would be defiled by using it.

The Colonel sahib was of the opinion that the excitement, which even he could not fail to see, would pass off, as it had done before, and he recommended me to go to my home.

Sitaram Pande, From Sepoy to Subedar, *pp. 162-63.*

Activity

1. What were the important concerns in the minds of the people according to Sitaram and according to Vishnubhatt?
2. What role did they think the rulers were playing? What role did the sepoys seem to play?

A Mutiny Becomes a Popular Rebellion

Though struggles between rulers and the ruled are not unusual, sometimes such struggles become quite widespread as a popular resistance so that the power of the state breaks down. A very large number of people begin to believe that they have a common enemy and rise up against the enemy at the same time. For such a situation to develop people have to organise, communicate, take initiative and display the confidence to turn the situation around.

Mutiny – When soldiers as a group disobey their officers in the army

Such a situation developed in the northern parts of India in 1857. After a hundred years of conquest and administration, the English East India Company faced a massive rebellion that started in May 1857 and threatened the Company's very presence in India. Sepoys mutinied in several places beginning from Meerut and a large number of people from different sections of society rose up in rebellion. Some regard it as the biggest armed resistance to colonialism in the nineteenth century anywhere in the world.

WHEN PEOPLE REBEL 55

The concept of Mutiny can be explained by making a comic strip on the Mutiny.

Fig. 4 *– The battle in the cavalry lines*

On the evening of 3 July 1857, over 3,000 rebels came from Bareilly, crossed the river Jamuna, entered Delhi, and attacked the British cavalry posts. The battle continued all through the night.

From Meerut to Delhi

On 29 March 1857, a young soldier, Mangal Pandey, was hanged to death for attacking his officers in Barrackpore. Some days later, some sepoys of the regiment at Meerut refused to do the army drill using the new cartridges, which were suspected of being coated with the fat of cows and pigs. Eighty-five sepoys were dismissed from service and sentenced to ten years in jail for disobeying their officers. This happened on 9 May 1857.

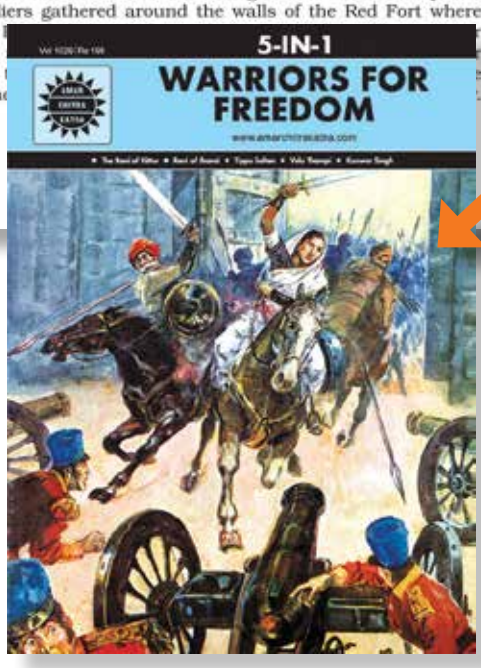
The response of the other Indian soldiers in Meerut was quite extraordinary. On 10 May, the soldiers marched to the jail in Meerut and released the imprisoned sepoys. They attacked and killed British officers. They captured guns and ammunition and set fire to the buildings and properties of the British and declared war on the ***firangis***. The soldiers were determined to bring an end to their rule in the country. But who would rule the land instead? The soldiers had an answer to this question – the Mughal emperor Bahadur Shah Zafar.

The sepoys of Meerut rode all night of 10 May to reach Delhi in the early hours next morning. As news of their arrival spread, the regiments stationed in Delhi also rose up in rebellion. Again british officers were killed, arms and ammunition seized, buildings set on fire. Triumphant soldiers gathered around the walls of the Red Fort where the
was
but
pala

Firangis – Foreigners The term reflects an attitude of contempt.

56 OUR PASTS – III

Select alternate ways of presentation; make use of audio visuals like, documentaries such as Bharat Ek Khoj, Amar Chitra Katha etc. while teaching different events covered in the chapter (keeping in mind the authenticity of the text).



Cover page of Amar Chitra Katha (http://www.amarchitrakatha.com)

The ageing emperor had to accept this demand. He wrote letters to all the chiefs and rulers of the country to come forward and organise a confederacy of Indian states to fight the British. This single step taken by Bahadur Shah had great implications.

The Mughal dynasty had ruled over a very large part of the country. Most smaller rulers and chieftains controlled different territories on behalf of the Mughal ruler. Threatened by the expansion of British rule, many of them felt that if the Mughal emperor could rule again, they too would be able to rule their own territories once more, under Mughal authority.

The British had not expected this to happen. They thought the disturbance caused by the issue of the cartridges would die down. But Bahadur Shah Zafar's decision to bless the rebellion changed the entire situation dramatically. Often when people see an alternative possibility they feel inspired and enthused. It gives them the courage, hope and confidence to act.

The rebellion spreads

After the British were routed from Delhi, there was no uprising for almost a week. It took that much time for news to travel. Then, a spurt of mutinies began.

Regiment after regiment mutinied and took off to join other troops at nodal points like Delhi, Kanpur and Lucknow. After them, the people of the towns and villages also rose up in rebellion and rallied around local leaders, zamindars and chiefs who were prepared to establish their authority and fight the British. Nana Saheb, the adopted son of the late Peshwa Baji Rao who lived near Kanpur, gathered forces and expelled the British garrison from the city. He proclaimed himself Peshwa. He declared that he was a governor under Emperor Bahadur Shah Zafar. In Lucknow, Birjis Qadr, the son of the deposed Nawab Wajid Ali Shah, was proclaimed the new Nawab. He too acknowledged the suzerainty of Bahadur Shah Zafar. His mother Begum Hazrat Mahal took an active part in organising the uprising against the British. In Jhansi, Rani Lakshmibai joined the rebel sepoys and

Fig. 5 – As the mutiny spread, British officers were killed in the cantonments

Before explaining the concept of "Rebellion Spreads" make a table with list of names and sequence of events covered, in the form of a timeline.

Fig. 8 – *British troops blow up Kashmere Gate to enter Delhi*

they would remain safe and their rights and claims to land would not be denied. Nevertheless, hundreds of sepoys, rebels, nawabs and rajas were tried and hanged.

Fig. 9 – *British forces capture the rebels near Kanpur*
Notice the way the artist shows the British soldiers valiantly advancing on the rebel forces.

Aftermath

The British had regained control of the country by the end of 1859, but they could not carry on ruling the land with the same policies any more.

Given below are the important changes that were introduced by the British.

1. The British Parliament passed a new Act in 1858 and transferred the powers of the East India Company to the British Crown in order to ensure a more responsible management of Indian affairs. A member of the British Cabinet was appointed Secretary of State for India and made responsible for all matters related to the governance of India. He was given a council to advise him, called the India Council. The Governor-General of India was given the title of Viceroy, that is, a personal representative of the Crown. Through[illegible] British government accepted dire[illegible] ruling India.

Make a table of the important changes that took place after the revolt.

2. All ruling chiefs of the country were assured that their territory would never be annexed in future. They were allowed to pass on their kingdoms to their heirs, including adopted sons. However, they were made to acknowledge the British Queen as their Sovereign Paramount. Thus the Indian rulers were to hold their kingdoms as subordinates of the British Crown.

3. It was decided that the proportion of Indian soldiers in the army would be reduced and the number of European soldiers would be increased. It was also decided that instead of recruiting soldiers from Awadh, Bihar, central India and south India, more soldiers would be recruited from among the Gurkhas, Sikhs and Pathans.

4. The land and property of Muslims was confiscated on a large scale and they were treated with suspicion and hostility. The British believed that they were responsible for the rebellion in a big way.

5. The British decided to respect the customary religious and social practices of the people in India.

6. Policies were made to protect landlords and zamindars and give them security of rights over their lands.

Thus a new phase of history began after 1857.

Fig. 10 – Some important centres of the Revolt in North India

WHEN PEOPLE REBEL 61

Use a graphic organiser to illustrate the Aftermath.

Highlight the cities in the map where the revolt took place.

Evaluation can be done by using methods such as :

Puting events in sequence.

Matching dates with events.

Adapting a Sample Chapter

Subject: Mathematics, Class – VI (Mathematics)

Sample pages from Chapter 7 "Fractions" with Suggestions

Fractions

Chapter 7

7.1 Introduction

Subhash had learnt about fractions in Classes IV and V, so whenever possible he would try to use fractions. One occasion was when he forgot his lunch at home. His friend Farida invited him to share her lunch. She had five pooris in her lunch box. So, Subhash and Farida took two pooris each. Then Farida made two equal halves of the fifth poori and gave one-half to Subhash and took the other half herself. Thus, both Subhash and Farida had 2 full pooris and one-half poori.

2 pooris + half-poori–Subhash
2 pooris + half-poori–Farida

Where do you come across situations with fractions in your life?

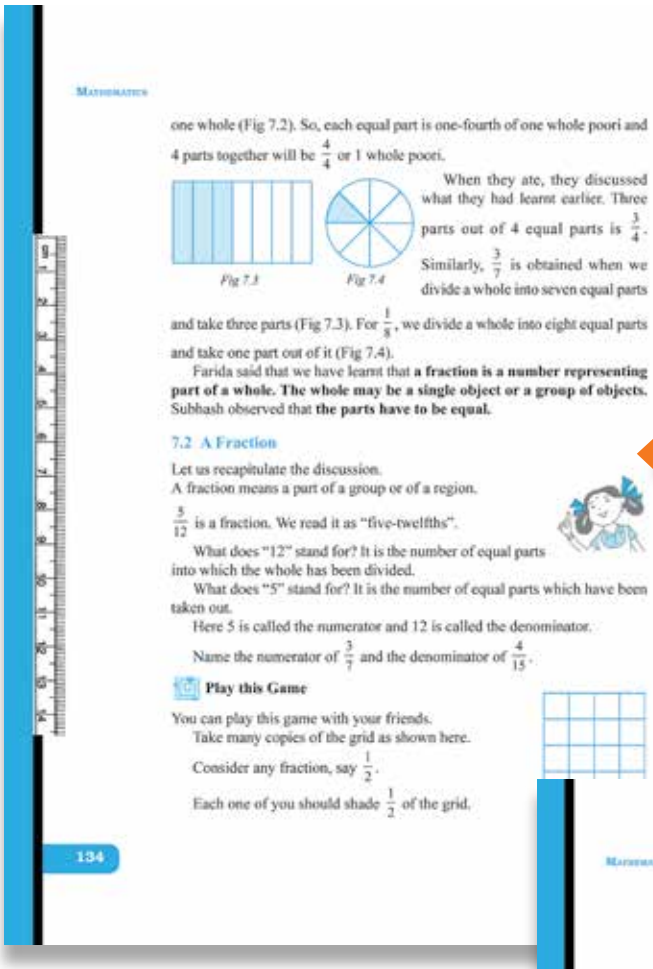
Fig 7.1

Subhash knew that one-half is written as $\frac{1}{2}$. While eating he further divided his half poori into two equal parts and asked Farida what fraction of the whole poori was that piece? (Fig 7.1)

Fig 7.2

Without answering, Farida also divided her portion of the half puri into two equal parts and kept them beside Subhash's shares. She said that these four equal parts together make

A variety of visual supports and experiential learning can be used in explaining the operations included in the chapter. It may help in enhancing the attention, memory and sequential learning skills of the child.



MATHEMATICS

one whole (Fig 7.2). So, each equal part is one-fourth of one whole poori and 4 parts together will be $\frac{4}{4}$ or 1 whole poori.

Fig 7.3

Fig 7.4

When they ate, they discussed what they had learnt earlier. Three parts out of 4 equal parts is $\frac{3}{4}$. Similarly, $\frac{3}{7}$ is obtained when we divide a whole into seven equal parts and take three parts (Fig 7.3). For $\frac{1}{8}$, we divide a whole into eight equal parts and take one part out of it (Fig 7.4).

Farida said that we have learnt that **a fraction is a number representing part of a whole. The whole may be a single object or a group of objects.** Subhash observed that **the parts have to be equal.**

7.2 A Fraction

Let us recapitulate the discussion.

A fraction means a part of a group or of a region.

$\frac{5}{12}$ is a fraction. We read it as "five-twelfths".

What does "12" stand for? It is the number of equal parts into which the whole has been divided.

What does "5" stand for? It is the number of equal parts which have been taken out.

Here 5 is called the numerator and 12 is called the denominator.

Name the numerator of $\frac{3}{7}$ and the denominator of $\frac{4}{15}$.

Play this Game

You can play this game with your friends.

Take many copies of the grid as shown here.

Consider any fraction, say $\frac{1}{2}$.

Each one of you should shade $\frac{1}{2}$ of the grid.

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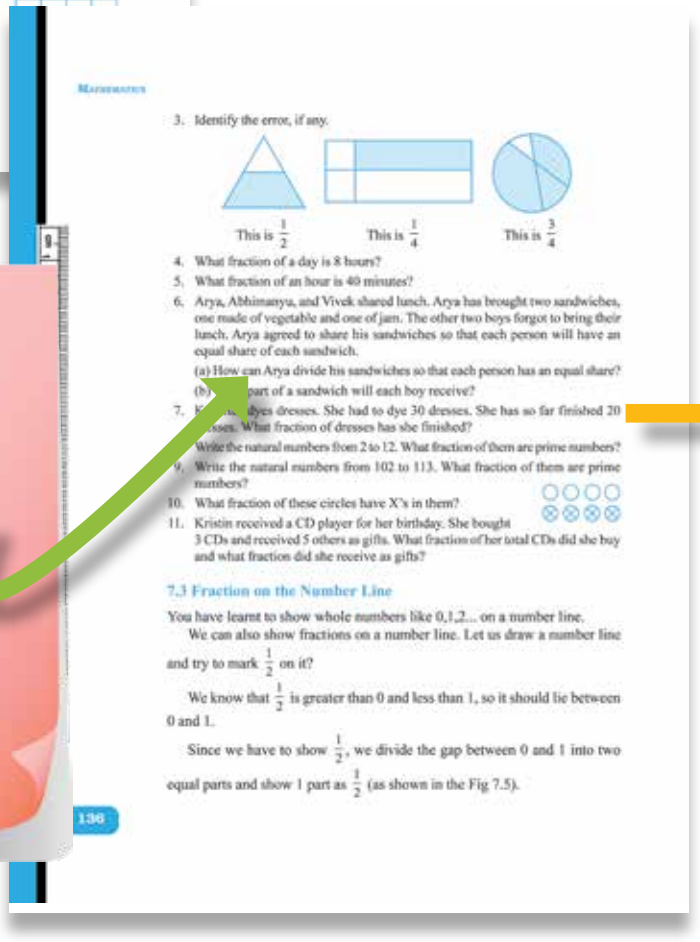
The chapter can be introduced through explaining the concept of 'whole' and 'part' through a variety of items, such as chappati, pizzas, paper etc.



MATHEMATICS

3. Identify the error, if any.

This is $\frac{1}{2}$ This is $\frac{1}{4}$ This is $\frac{3}{4}$

4. What fraction of a day is 8 hours?
5. What fraction of an hour is 40 minutes?
6. Arya, Abhimanyu, and Vivek shared lunch. Arya has brought two sandwiches, one made of vegetable and one of jam. The other two boys forgot to bring their lunch. Arya agreed to share his sandwiches so that each person will have an equal share of each sandwich.
   (a) How can Arya divide his sandwiches so that each person has an equal share?
   (b) [illegible] part of a sandwich will each boy receive?
7. [illegible] dyes dresses. She had to dye 30 dresses. She has so far finished 20 [illegible]sses. What fraction of dresses has she finished?
8. Write the natural numbers from 2 to 12. What fraction of them are prime numbers?
9. Write the natural numbers from 102 to 113. What fraction of them are prime numbers?
10. What fraction of these circles have X's in them?

11. Kristin received a CD player for her birthday. She bought 3 CDs and received 5 others as gifts. What fraction of her total CDs did she buy and what fraction did she receive as gifts?

7.3 Fraction on the Number Line

You have learnt to show whole numbers like 0,1,2... on a number line.

We can also show fractions on a number line. Let us draw a number line and try to mark $\frac{1}{2}$ on it?

We know that $\frac{1}{2}$ is greater than 0 and less than 1, so it should lie between 0 and 1.

Since we have to show $\frac{1}{2}$, we divide the gap between 0 and 1 into two equal parts and show 1 part as $\frac{1}{2}$ (as shown in the Fig 7.5).

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Rules for carrying out various operations can be written separately and provided to the student. Visually representing information in the form of specific rules, can help students to call on their strong abilities to visualise information.

Fractions	
Content	***Rules for carrying out various operations (Examples)***
1. *How to change mixed fraction into Improper Fraction*	• *Multiply the whole number by the denominator : Whole Number X Denominator* • *To this add the Numerator.* • *Express as Improper Fraction =* $\frac{\text{(Whole Number X Denominator) + Numerator}}{\text{Denominator (D)}}$
2. *Type of Fractions*	• *See the Denominators. If they are same they are Like Fractions.* • *See the Denominators. If they are different they are Unlike Fractions.* • *If the Numerator is more than the Denominator, it is an Improper Fraction.* • *If there is a whole number before the fraction, it is a Mixed Fraction.*
3. *How to find Equivalent Fraction*	• *Multiply the Numerator and the Denominator by the same number:* $\frac{\text{Numerator}}{\text{Denominator}} \times \frac{\text{Number}}{\text{Number}}$ • *Divide the Numerator and the Denominator by the same number :* $\frac{\text{Numerator} \;/\; \text{Number}}{\text{Denominator} \;/\; \text{Number}}$
4. *How to add Fractions*	• *See the Denominators.* • *If they are the same, add the Numerators.* • *If they are different, find the LCM of the two Denominators to get a Common Denominator.* • *Multiply both the Numerators by the number obtained by dividing the original Denominator and the Common Denominator.* • *Add all Numerators and write this above the Common Denominator.* • *Finish all sums in the assignment.* • *Check the work.*

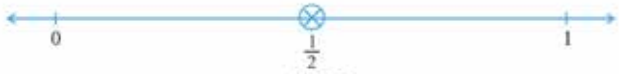

Fig 7.5

Suppose we want to show $\frac{1}{3}$ on a number line. Into how many equal parts should the length between 0 and 1 be divided? We divide the length between 0 and 1 into 3 equal parts and show one part as $\frac{1}{3}$ (as shown in the Fig 7.6)

Fig 7.6

Can we show $\frac{2}{3}$ on this number line? $\frac{2}{3}$ means 2 parts out of 3 parts as shown (Fig 7.7).

Fig 7.7

Similarly, how would you show $\frac{0}{3}$ and $\frac{3}{3}$ on this number line?

$\frac{0}{3}$ is the point zero whereas since $\frac{3}{3}$ is 1 whole, it can be shown by the point 1 (as shown in Fig 7.7)

So if we have to show $\frac{3}{7}$ on a number line, then, into how many equal parts should the length between 0 and 1 be divided? If P shows $\frac{3}{7}$ then how many equal divisions lie between 0 and P? Where do $\frac{0}{7}$ and $\frac{7}{7}$ lie?

Try These

1. Show $\frac{3}{5}$ on a number line.
2. Show $\frac{1}{10}$, $\frac{0}{10}$, $\frac{5}{10}$ and $\frac{10}{10}$ on a number line.
3. Can you show any other fraction between 0 and 1? Write five more fractions that you can show and depict them on the number line.
4. How many fractions lie between 0 and 1? Think, discuss and write your answer?

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Provide Number Line with gem clips for children who have difficulty in drawing a line. It can also be done using strips.

Anagha said, 'Let each of us have one full apple and a quarter of the fifth apple.'

Anagha Ravi Reshma John

Reshma said, 'That is fine, but we can also divide each of the five apples into 4 equal parts and take one-quarter from each apple.'

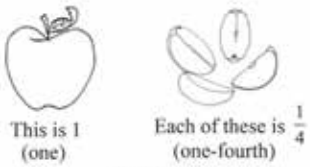
Anagha Ravi Reshma John

Ravi said, 'In both the ways of sharing each of us would get the same share, i.e., 5 quarters. Since 4 quarters make one whole, we can also say that each of us would get 1 whole and one quarter. The value of each share would be five divided by four. Is it written as $5 \div 4$?' John said, 'Yes the same as $\frac{5}{4}$'. Reshma added that in $\frac{5}{4}$, the numerator is bigger than the denominator. The fractions, where the numerator is bigger than the denominator are called **improper fractions.** Thus, fractions like $\frac{3}{2}, \frac{12}{7}, \frac{18}{5}$ are all improper fractions.

1. Write five improper fractions with denominator 7.
2. Write five improper fractions with numerator 11.

Ravi reminded John, 'What is the other way of writing the share? Does it follow from Anagha's way of dividing 5 apples?'

John nodded, 'Yes, It indeed follows from Anagha's way. In her way, each share is one whole and one quarter. It is $1+\frac{1}{4}$ and written in short as $1\frac{1}{4}$. Remember, $1\frac{1}{4}$ is the same as $\frac{5}{4}$.



This is 1 (one) Each of these is $\frac{1}{4}$ (one-fourth)

Fig 7.8

Give separate rules for identifying Fractions, as a reminder. For example,

If the Numerators are more than the Denominator, it is an Improper Fraction.

If there is a Whole Number before the fraction, it is a Mixed Fraction.

See the Denominators. If they are same they are Like Fractions.

See the Denominators. If they are different they are Unlike Fractions.

Try (c) and (d) using both the methods for yourself.

Thus, we can express an improper fraction as a mixed fraction by dividing the numerator by denominator to obtain the quotient and the remainder. Then the mixed fraction will be written as $\text{Quotient}\ \frac{\text{Remainder}}{\text{Divisor}}$.

Example 2 : Express the following mixed fractions as improper fractions:

(a) $2\frac{3}{4}$ (b) $7\frac{1}{9}$ (c) $5\frac{3}{7}$

Solution : (a) $2\frac{3}{4} = 2+\frac{3}{4} = \frac{2\times4}{4}+\frac{3}{4} = \frac{11}{4}$

(b) $7\frac{1}{9} = \frac{(7\times9)+1}{9} = \frac{64}{9}$

(c) $5\frac{3}{7} = \frac{(5\times7)+3}{7} = \frac{38}{7}$

Thus, we can express a mixed fraction as an improper fraction as

$$\frac{(\text{Whole} \times \text{Denominator}) + \text{Numerator}}{\text{Denominator}}$$

EXERCISE 7.2

1. Draw number lines and locate the points on them :

(a) $\frac{1}{2}, \frac{1}{4}, \frac{3}{4}, \frac{4}{4}$ (b) $\frac{1}{8}, \frac{2}{8}, \frac{3}{8}, \frac{7}{8}$ (c) $\frac{2}{5}, \frac{3}{5}, \frac{8}{5}, \frac{4}{5}$

2. Express the following as mixed fractions :

(a) $\frac{20}{3}$ (b) $\frac{11}{5}$ (c) $\frac{17}{7}$

(d) $\frac{28}{5}$ (e) $\frac{19}{6}$ (f) $\frac{35}{9}$

3. Express the following as improper fractions :

(a) $7\frac{3}{4}$ (b) $5\frac{6}{7}$ (c) $2\frac{5}{6}$ (d) $10\frac{3}{5}$ (e) $9\frac{3}{7}$ (f) $8\frac{4}{9}$

Use adapted number line to show the conversion of mixed fraction into Improper Fraction or vice versa.
Separate rules can be provided, as a reminder.
Multiply the Whole Number by the denominator.
Whole Number X Denominator
To this add the Numerator
Express as Improper Fraction =

$$\frac{\text{(Whole Number X Denominator) + Numerator}}{\text{Denominator (D)}}$$

To find an equivalent fraction of a given fraction, you may multiply both the numerator and the denominator of the given fraction by the same number.

Rajni says that equivalent fractions of $\frac{1}{3}$ are :

$\frac{1\times2}{3\times2}=\frac{2}{6}$, $\frac{1\times3}{3\times3}=\frac{3}{9}$, $\frac{1\times4}{3\times4}=\frac{4}{12}$ and many more.

Do you agree with her? Explain.

Try These

1. Find five equivalent fractions of each of the following:

(i) $\frac{2}{3}$ (ii) $\frac{1}{5}$ (iii) $\frac{3}{5}$ (iv) $\frac{5}{9}$

Another way

Is there any other way to obtain equivalent fractions? Look at Fig 7.11.

$\frac{4}{6}$ is shaded here. $\frac{2}{3}$ is shaded here.

Fig 7.11

These include equal number of shaded things i.e. $\frac{4}{6}=\frac{2}{3}=\frac{4\div2}{6\div2}$

To find an equivalent fraction, we may divide both the numerator and the denominator by the same number.

One equivalent fraction of $\frac{12}{15}$ is $\frac{12\div3}{15\div3}=\frac{4}{5}$

Can you find an equivalent fraction of $\frac{9}{15}$ having denominator 5 ?

Example 3 : Find the equivalent fraction of $\frac{2}{5}$ with numerator 6.

Solution : We know $2 \times 3 = 6$. This means we need to multiply both the numerator and the denominator by 3 to get the equivalent fraction.

Equivalent Fraction can be explained experientially using concrete objects like paper sheets.

Provide separate rules for finding Equivalent Fraction

Multiply the Numerator and the Denominator by the same number

$\frac{\text{Numerator}}{\text{Denominator}} \times \frac{\text{Number}}{\text{Number}}$

Divide the Numerator and the Denominator by the same number

$\frac{\text{Numerator} \;/\; \text{Number}}{\text{Denominator} \;/\; \text{Number}}$

3. Replace □ in each of the following by the correct number :

(a) $\frac{2}{7}=\frac{8}{\square}$ (b) $\frac{5}{8}=\frac{10}{\square}$ (c) $\frac{3}{5}=\frac{\square}{20}$ (d) $\frac{45}{60}=\frac{15}{\square}$ (e) $\frac{18}{24}=\frac{\square}{4}$

4. Find the equivalent fraction of $\frac{3}{5}$ having

(a) denominator 20 (b) numerator 9

(c) denominator 30 (d) numerator 27

5. Find the equivalent fraction of $\frac{36}{48}$ with

(a) numerator 9 (b) denominator 4

6. Check whether the given fractions are equivalent :

(a) $\frac{5}{9}, \frac{30}{54}$ (b) $\frac{3}{10}, \frac{12}{50}$ (c) $\frac{7}{13}, \frac{5}{11}$

7. Reduce the following fractions to simplest form :

(a) $\frac{48}{60}$ (b) $\frac{150}{60}$ (c) $\frac{84}{98}$ (d) $\frac{12}{52}$ (e) $\frac{7}{28}$

8. Ramesh had 20 pencils, Sheelu had 50 pencils and Jamaal had 80 pencils. After 4 months, Ramesh used up 10 pencils, Sheelu used up 25 pencils and Jamaal used up 40 pencils. What fraction did each use up? Check if each has used up an equal fraction of her/his pencils?

9. Match the equivalent fractions and write two more for each.

(i) $\frac{250}{400}$	(a) $\frac{2}{3}$	(iv) $\frac{180}{360}$	(d) $\frac{5}{8}$
(ii) $\frac{180}{200}$	(b) $\frac{2}{5}$	(v) $\frac{220}{550}$	(e) $\frac{9}{10}$
(iii) $\frac{660}{990}$	(c) $\frac{1}{2}$		

7.8 Like Fractions

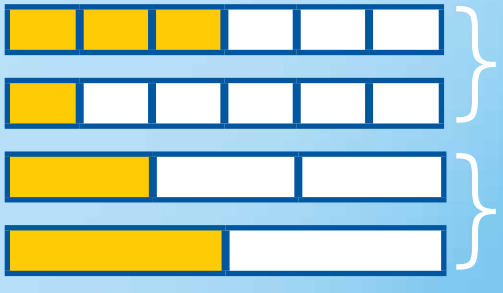
Fractions with same denominators are called **like fractions**.

Thus, $\frac{1}{15}, \frac{2}{15}, \frac{3}{15}, \frac{8}{15}$ are all like fractions. Are $\frac{7}{27}$ and $\frac{7}{28}$ like fractions?

Their denominators are different. Therefore, they are not like fractions. They are called **unlike fractions**.

Write five pairs of like fractions and five pairs of unlike fractions.

Use visual cues to explain and show the difference between Like/ Unlike Fractions.



7.9 Comparing Fractions

Sohni has $3\frac{1}{2}$ rotis in her plate and Rita has $2\frac{3}{4}$ rotis in her plate. Who has more rotis in her plate? Clearly, Sohni has 3 full rotis and more and Rita has less than 3 rotis. So, Sohni has more rotis.

Consider $\frac{1}{2}$ and $\frac{1}{3}$ as shown in Fig. 7.12. The portion of the whole corresponding to $\frac{1}{2}$ is clearly larger than the portion of the same whole corresponding to $\frac{1}{3}$.

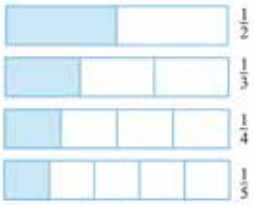


Fig 7.12

So $\frac{1}{2}$ is greater than $\frac{1}{3}$.

But often it is not easy to say which one out of a pair of fractions is larger. For example, which is greater, $\frac{1}{4}$ or $\frac{3}{10}$? For this, we may wish to show the fractions using figures (as in fig. 7.12), but drawing figures may not be easy especially with denominators like 13. We should therefore like to have a systematic procedure to compare fractions. It is particularly easy to compare like fractions. We do this first.

Try These

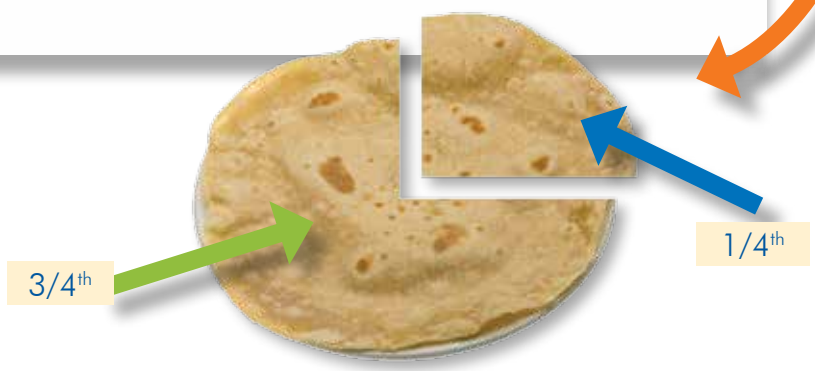
1. You get one-fifth of a bottle of juice and your sister gets one-third of the same size of a bottle of juice. Who gets more?

7.9.1 Comparing like fractions

Like fractions are fractions with the same denominator. Which of these are like fractions?

$\frac{2}{5}, \frac{3}{4}, \frac{1}{5}, \frac{7}{2}, \frac{3}{5}, \frac{4}{5}, \frac{4}{7}$

Explain Comparison of Fractions through demonstration. For example, the students can observe that when a chappati is cut into 2 pieces they get bigger pieces, as compared to when the chapatti is cut into four pieces.



(g) $\frac{1}{4} \square \frac{2}{8}$ (h) $\frac{6}{10} \square \frac{4}{5}$ (i) $\frac{3}{4} \square \frac{7}{8}$

(j) $\frac{6}{10} \square \frac{4}{5}$ (k) $\frac{5}{7} \square \frac{15}{21}$

6. The following fractions represent just three different numbers. Separate them into three groups of equivalent fractions, by changing each one to its simplest form.

(a) $\frac{2}{12}$ (b) $\frac{3}{15}$ (c) $\frac{8}{50}$ (d) $\frac{16}{100}$ (e) $\frac{10}{60}$ (f) $\frac{15}{75}$

(g) $\frac{12}{60}$ (h) $\frac{16}{96}$ (i) $\frac{12}{75}$ (j) $\frac{12}{72}$ (k) $\frac{3}{18}$ (l) $\frac{4}{25}$

7. Find answers to the following. Write and indicate how you solved them.

(a) Is $\frac{5}{9}$ equal to $\frac{4}{5}$? (b) Is $\frac{9}{16}$ equal to $\frac{5}{9}$?

(c) Is $\frac{4}{5}$ equal to $\frac{16}{20}$? (d) Is $\frac{1}{15}$ equal to $\frac{4}{30}$?

8. Ila read 25 pages of a book containing 100 pages. Lalita read $\frac{2}{5}$ of the same book. Who read less?

9. Rafiq exercised for $\frac{3}{6}$ of an hour, while Rohit exercised for $\frac{3}{4}$ of an hour. Who exercised for a longer time?

10. In a class A of 25 students, 20 passed in first class; in another class B of 30 students, 24 passed in first class. In which class was a greater fraction of students getting first class?

7.10 Addition and Subtraction of Fractions

So far in our study we have learnt about natural numbers, whole numbers and then integers. In the present chapter, we are learning about fractions, a different type of numbers.

Whenever we come across new type of numbers, we want to know how to operate with them. Can we combine and add them? If so, how? Can we take

Provide separate rules for addition and subtraction of fractions.

Rule for Addition of Fraction

- *See the Denominators*
- *If they are same, add the Numerators*
- *If they are different, find the LCM of the two Denominators to get a common Denominator*
- *Multiply both the Numerators by the number obtained by dividing the original denominator and the common denominator*
- *Add all Numerators and write the sum above the common denominator*
- *Finish all sums in the assignment*
- *Check the work*

Look at more examples

In Fig 7.14 (i) we have 2 quarter parts of the figure shaded. This means we have 2 parts out of 4 shaded or $\frac{1}{2}$ of the figure shaded.

Fig. 7.14 (i)

Fig. 7.14 (ii)

That is, $\frac{1}{4}+\frac{1}{4}=\frac{1+1}{4}=\frac{2}{4}=\frac{1}{2}$.

Look at Fig 7.14 (ii)

Fig 7.14 (ii) demonstrates $\frac{1}{9}+\frac{1}{9}+\frac{1}{9}=\frac{1+1+1}{9}=\frac{3}{9}=\frac{1}{3}$.

What do we learn from the above examples? The sum of two or more like fractions can be obtained as follows :

Step 1 Add the numerators.

Step 2 Retain the (common) denominator.

Step 3 Write the fraction as :

$$\frac{\text{Result of Step 1}}{\text{Result of Step 2}}$$

Try These

1. Add with the help of a diagram.
   (i) $\frac{1}{8}+\frac{1}{8}$ (ii) $\frac{2}{5}+\frac{3}{5}$ (iii) $\frac{1}{6}+\frac{1}{6}+\frac{1}{6}$
2. Add $\frac{1}{12}+\frac{1}{12}$. How will we show this pictorially? Using paper folding?
3. Make 5 more examples of problems given in 1 and 2 above. Solve them with your friends.

Let us, thus, add $\frac{3}{5}$ and $\frac{1}{5}$.

We have $\frac{3}{5}+\frac{1}{5}=\frac{3+1}{5}=\frac{4}{5}$

So, what will be the sum of $\frac{7}{12}$ and $\frac{3}{12}$?

Finding the balance

Sharmila had $\frac{5}{6}$ of a cake. She gave $\frac{2}{6}$ out of that to her younger brother. How much cake is left with her?

A diagram can explain the situation (Fig 7.15). (Note that, here the given fractions are like fractions).

We find that $\frac{5}{6}-\frac{2}{6}=\frac{5-2}{6}=\frac{3}{6}$ or $\frac{1}{2}$

(Is this not similar to the method of adding like fractions?)

While explaining addition or subtraction of Fractions always go step by step. Explain it through demonstration by making use concrete objects and visual support.

Think, discuss and write

Can you find the other way of doing this sum?

Example 12 : Find $4\frac{2}{5}-2\frac{1}{5}$

Solution : The whole numbers 4 and 2 and the fractional numbers $\frac{2}{5}$ and $\frac{1}{5}$ can be subtracted separately. (Note that $4 > 2$ and $\frac{2}{5} > \frac{1}{5}$)

So, $4\frac{2}{5}-2\frac{1}{5}=(4-2)+\left(\frac{2}{5}-\frac{1}{5}\right)=2+\frac{1}{5}=2\frac{1}{5}$

Example 13 : Simplify: $8\frac{1}{4}-2\frac{5}{6}$

Solution : Here $8 > 2$ but $\frac{1}{4} < \frac{5}{6}$. We proceed as follows:

$8\frac{1}{4}=\frac{(8\times4)+1}{4}=\frac{33}{4}$ and $2\frac{5}{6}=\frac{2\times6+5}{6}=\frac{17}{6}$

Now, $\frac{33}{4}-\frac{17}{6}=\frac{33\times3}{12}-\frac{17\times2}{12}$ (Since LCM of 4 and 6 = 12)

$=\frac{99-34}{12}=\frac{65}{12}=5\frac{5}{12}$

EXERCISE 7.6

1. Solve

(a) $\frac{2}{3}+\frac{1}{7}$ (b) $\frac{3}{10}+\frac{7}{15}$ (c) $\frac{4}{9}+\frac{2}{7}$ (d) $\frac{5}{7}+\frac{1}{3}$ (e) $\frac{2}{5}+\frac{1}{6}$

(f) $\frac{4}{5}+\frac{2}{3}$ (g) $\frac{3}{4}\ \frac{1}{3}$ (h) $\frac{5}{6}\ \frac{1}{3}$ (i) $\frac{2}{3}+\frac{3}{4}+\frac{1}{2}$ (j) $\frac{1}{2}+\frac{1}{3}+\frac{1}{6}$

(k) $1\frac{1}{3}+3\frac{2}{3}$ (l) $4\frac{2}{3}+3\frac{1}{4}$ (m) $\frac{16}{5}\ \frac{7}{5}$ (n) $\frac{4}{3}\ \frac{1}{2}$

2. Sarita bought $\frac{2}{5}$ metre of ribbon and Lalita $\frac{3}{4}$ metre of ribbon. What is the total length of the ribbon they bought?

3. Naina was given $1\frac{1}{2}$ piece of cake and Najma was given $1\frac{1}{3}$ piece of cake. Find the total amount of cake was given to both of them.

Evaluation can be done using some activities; for example, student can cook simple recipes that use fractions such as fruit salad.

Match equivalent fractions.

Represent fractions on number lines provided.

Give the picture of any object which is divided into parts and ask the student to represent the portion through fraction.

Mark proper fraction, improper fraction and mixed fraction in a series.

Adapting a Sample Chapter

Subject: Science, Class – VIII (Science)

Sample pages from Chapter 4 "Materials: Metals and Non Metals" with Suggestions

CHAPTER

4

Materials : Metals and Non-Metals

You are familiar with a number of ma[illegible], copp[illegible], etc. Some materials have been given in Table 4.1.

Table 4.1 : Appearance and Hardness of Materials

Object/ Material	Appearance (Shiny/Dull)	Hardness (Very hard/ Not very hard)
Iron		
Coal		
Sulphur		
Aluminium		
Copper		

Can you name the materials which are metals? The rest of the materials in Table 4.1 are non-metals. Metals can be distinguished from non-metals on the basis of their physical and chemical properties. Recall that lustre and hardness are physical properties.

4.1 Physical Properties of Metals and Non-metals

Have you ever seen a blacksmith beating [illegible] wood log ?

Let us find out.

Activity 4.1

Take a small iron nail, a coal piece, a piece of thick aluminium wire and a pencil lead. Beat the iron nail with a hammer (Fig. 4.1). *(But take care that you don't hurt yourself in the process.)* Try to hit hard. Hit hard

***Fig. 4.1 :** Beating an iron nail with hammer*

the aluminium wire also. Then repeat the same kind of treatment on the coal piece and pencil lead. Record your observations in Table 4.2.

Table 4.2 : Malleability of Materials

Object/ Material	Change in Shape (Flattens/Breaks into pieces)
Iron nail	
Coal piece	

All concepts in the chapter can be accompanied by pictures to make them simpler. The teacher should demonstrate all the activities that are given in the book, as it will make the task interesting and simple.

Connect present learning with prior knowledge. Encourage the child to explore, for example, students can look around and separately list the objects in the room into metal and non-metal items.

or Explain the concept of Metals and Non- Metals through pictures. For Metals show a picture of a shiny copper vessel or gold jewellery and for Non- Metals, show picture of plastic vessels or plastic jewellery.

Give explanation of physical and chemical properties in simple words before moving forward. For example, how a material looks, feels, sounds, smells, plus taste- all these are its physical properties; how a material reacts with other materials, whether it is acidic or not, are its chemical properties.

You saw that the shape of the iron nail and the aluminium wire changed on heating. If they were beaten harder these be changed into sheets. You might niliar with silver foil used for ting sweets. You must also be r with the aluminium foil used for ing food. The property of metals by they can be beaten into thin sheets led **malleability**. This is a teristic property of metals. As you ave noticed, materials like coal and ead do not show this property. Can these metals?

you hold a hot metallic pan which out a plastic or a wooden handle t get hurt? Perhaps not! Why? Try ome other experiences in which a or plastic handle protects you eing hurt while handling hot On the basis of these experiences n you say about the conduction by wood and plastic?

must have seen an electrician is screw driver. What kind of does it have? Why?

s find out.

y 4.2

how to make an electric to test whether electricity can pass through an object or not (Fig. 4.2). You might have performed

Fig. 4.2 : Electric tester

the activity with various objects in Class VI. Now, repeat the activity with the materials mentioned in Table 4.3. Observe and group these materials into good conductors and poor conductors.

Table 4.3 : Electrical Conductivity of Materials

S.No.	Materials	Good Conductor / Poor Conductor
1.	Iron rod/nail	
2.	Sulphur	
3.	Coal piece	
4.	Copper wire	

You observe that iron rod, nail and copper wire are good conductors while rolled sulphur piece and coal piece are poor conductors.

Oh! The meaning of recalling our experiences and then of this activity was to show that metals are good conductors of heat and electricity. We learnt this in Class VI.

Where do you find the use of aluminium and copper wires? Have you seen wires of coal? Definitely not!

The property of metal by which it can be drawn into wires is called **ductility**.

Have you ever noticed the difference in sound on dropping an iron ...et/ plate, a metal coin, and a piece of coal on the floor? If not, you can try ... now.

Do you note any difference in the sound produced?

MATERIALS : METALS AND NON-METALS 45

Important concepts and definitions should be highlighted in bold or underlined, such as, Malleability, Ductility etc.

Have you seen wooden bells in temples? Can you give a reason?

The things made of metals produce a ringing sound when struck hard. Suppose you have two boxes similar in appearance, one made of wood and the other of metal. Can you tell which box is made of metal by striking both the boxes?

Since metals produce ringing sounds, they are said to be **sonorous**. The materials other than metals are not sonorous.

After performing the above activities, we can say that some materials are **hard, lustrous, malleable, and good conductors of heat and electricity.** The materials which generally possess these properties are called metals. The examples of metals are iron, copper, aluminium, calcium, magnesium, etc. In contrast, materials like coal and sulphur are soft and dull in appearance. They break down into a powdery mass on tapping with a hammer. They are not sonorous and are poor conductors of heat and electricity. These materials are called **non-metals.** The examples of non-metals are sulphur, carbon, oxygen, phosphorus, etc.

Metals like sodium and potassium are soft and can be cut with a knife. Mercury is the only metal which is found in liquid state at room temperature. These are exceptions.

4.2 Chemical Properties of Metals and Non-metals

Reaction with Oxygen

You are familiar with the phenomenon of rusting of iron. Recall the reaction by which rust is formed. You performed in Class VII an burning a magnesium ribbon had learnt that in both the oxide formation takes place. the following reactions of magnesium with oxygen.

Iron (Fe) + Oxygen (O_2) + Water
Magnesium (Mg) + Oxygen (O

Activity 4.3

Let us check the nature formed as a result of the between iron, oxygen and dissolve it in a very little an water. You will find that t remains suspended in wate the suspension well. T solution with red and blue papers (Fig. 4.3). What observe? Is the solution a basic?

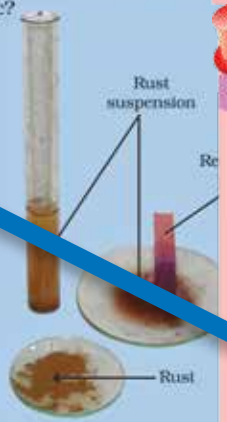


Fig. 4.3 : Testing the nature of

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Explain each abstract concept with the help of visual support or concrete objects. For example, picture of a hammer hitting an aluminium sheet can be used while explaining the concept of Malleable.

After each concept is taught there should be a recap in terms of a mind map or graphic organiser.

Page no. 105 (refer mind map)

Encourage the students to actively participate in the activities and learn experientially. Explain abstract concepts through activities, for example, divide the class into 5 groups, each representing one physical concept (malleability, ductility, sonorous, hard and lustrous, and conductivity). Give supporting resources, such as dictionary, pictures, actual metals, electric wire etc. Encourage brainstorming, followed by discussion and group sharing.

Table 4.4 : Metals and Non-metals in Acids and Bases

S.No.	Name of the Base	Metal	Name of the Acid	Non-metal
1.	Calcium hydroxide	Calcium	Sulphuric acid	Sulphur
2.				
3.				
4.				
5.				

The name of the product formed in the reaction of sulphur and oxygen is sulphur dioxide gas. When sulphur dioxide is dissolved in water sulphurous acid is formed. The reaction can be given as follows:

Sulphur dioxide (SO_2) + Water (H_2O) → Sulphurous acid (H_2SO_3)

The sulphurous acid turns blue litmus paper red. Generally, oxides of non-metals are acidic in nature.

Recall the name of some of the laboratory acids and bases you have read in Class VII. Note down their names in Table 4.4. Identify the metal or non-metal present in them which forms oxides with oxygen.

Reaction with Water

Let us see how metals and non-metals react with water.

Sodium metal is very reactive. It reacts vigorously with oxygen and water. A lot of heat is generated in the reaction. It is, therefore, stored in kerosene.

Activity 4.5

(To be demonstrated by the teacher. During demonstration special care should be taken that the size of the sodium metal piece is roughly the size of a wheat grain. It should be held with a pair of tongs.)

Take a 250 mL beaker/glass tumbler. Fill half of it with water. Now carefully cut a small piece of sodium metal. Dry it using filter paper and wrap it in a small piece of cotton. Put the sodium piece wrapped in cotton into the beaker. Observe carefully. *(During observation keep away from the beaker).* When reaction stops touch the beaker. What do you feel? Has the beaker become hot? Test the solution with red and blue litmus papers. Is the solution acidic or basic?

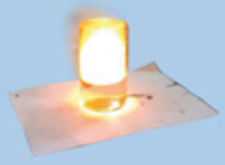


Fig. 4.5 : *Reaction of sodium with water*

Chemical properties of Metals and Non Metals can be explained by taking the students to the chemistry lab and making them learn by actually doing experiments. This can also be done through demonstration.

Is there a difference in the way metals and non-metals react with acids? What could the 'pop' sound in some cases be due to when a burning match stick is brought near the mouth of the test tubes?

You must have found that non-metals generally do not react with acids but metals react with acids and produce hydrogen gas that burns with a 'pop' sound. You must have noticed that copper does not react with dilute hydrochloric acid even on heating but it reacts with sulphuric acid.

Reactions with Bases

Activity 4.7

(To be demonstrated by the teacher. During the preparation of sodium hydroxide solution, care should be taken that pellets of sodium hydroxide are handled with a plastic spatula).

Prepare a fresh solution of sodium hydroxide in a test tube by dissolving 3-4 pellets of it in 5 mL of water. Drop a piece of aluminium foil into it. Bring a burning match stick near the mouth of the test tube. Observe carefully.

What does the 'pop' sound indicate? As before, the 'pop' sound indicates the presence of hydrogen gas.

Metals react with sodium hydroxide to produce hydrogen gas.

Reactions of non-metals with bases are complex.

Displacement Reactions

Recall the activity of the reaction between copper sulphate and iron that you performed in Class VII. Let us observe some more reactions of that kind.

Activity 4.8

Take five 100 mL beakers and label them A, B, C, D and E. Take about 50 mL of water in each beaker. Dissolve in each beaker a teaspoonful of each substance as indicated in Fig. 4.6 (a).

- Keep the beakers undisturbed for some time.
- Record your observations in your note book.

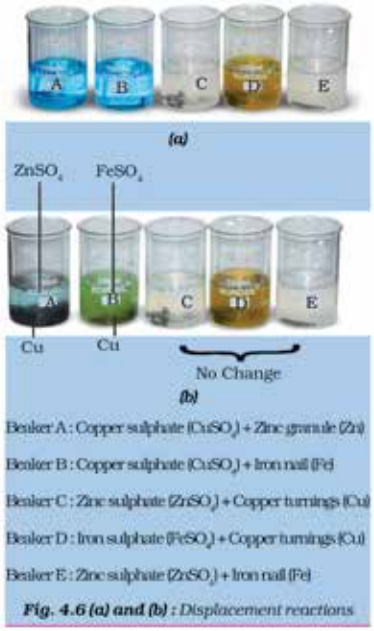


Fig. 4.6 (a) and (b) : *Displacement reactions*

Organise all concepts into Question – Answer format for mid-way revision; this helps in terms of memorisation.

It is better to have a space for the child to write conclusions or observations of activities.

Use pictures and other visual support to explain the uses of Metals and Non Metals. This can be also taught by giving project work to the students on uses of Metals and Non Metals.

What changes do you observe in the various beakers? You have read that one metal displaces another metal from its compound in aqueous solution. In beaker 'A' zinc (Zn) replaces copper (Cu) from copper sulphate ($CuSO_4$). That is why the blue colour of copper sulphate
s and a powdery red mass of
deposited at the bottom of the
e reaction can be represented

ulphate ($CuSO_4$) + Zinc (Zn)
lue)
urless) (Red)

n write down the reaction
ce in beaker 'B' in a similar

we understood the reactions
ing place in beakers 'A' and
But I am still confused why
re is no change in beakers
'C', 'D' and 'E'?

uld have been displacement of zinc by copper in beaker 'C' and by iron in beaker 'E'. Similarly iron could be displaced by copper in beaker 'D'.

Since we do not see any change in beaker C, we can infer that copper is not able to replace zinc from zinc sulphate. But why? When zinc can replace copper in beaker 'A' why cannot copper replace zinc in beaker 'C'? Remember that science is not arbitrary. It follows definite rules based on facts. And the rule here is that zinc is more reactive than copper and iron. A more reactive metal can replace a less reactive metal, but a less reactive one cannot replace a more reactive metal. Now you can understand why there are no displacement reactions in beakers D and E also. Can you guess the sequence of metals from more reactive to less reactive among zinc, iron and copper?

4.3 Uses of Metals and Non-metals

You should be able to guess why metals are used in making machinery, automobiles, aeroplanes, trains, satellites, industrial gadgets, cooking utensils, water boilers, etc. You are also familiar with the uses of some non-metals. Here are some interesting ones. We are sure that you will guess them right:

- Non-metal is essential for our life which all living beings inhale during breathing.
- Non-metals used in fertilisers to enhance the growth of plants.
- Non-metal used in water purification process.
- Non-metal used in the purple coloured solution which is applied on wounds as an antiseptic.
- Non-metals used in crackers.

You may add some more uses of metals and non-metals from your experiences.

MATERIALS : METALS AND NON-METALS 51

KEYWORDS

- ATOM
- CONDUCTOR
- DISPLACEMENT REACTION
- DUCTILITY
- ELEMENTS
- HARDNESS
- MALLEABILITY
- METALS
- METALLOIDS
- NON-METALS
- SONOROUS

WHAT YOU HAVE LEARNT

- Metals are lustrous whereas non-metals have no lustre.
- Generally, metals are malleable and ductile. Non-metals do not have these properties.
- Generally, metals are good conductors [illegible] and electricity but non-metals are [illegible] conductors.
- On burning, metals react with oxyg[illegible] produce metal oxides which are ba[illegible] nature. Non-metals react with oxyg[illegible] produce non- metallic oxides which are [illegible] in nature.
- Some metals react with water to produce [illegible] hydroxides and hydrogen gas. Generally [illegible] metals do not react with water.
- Metals react with acids and produce [illegible] [illegible] do not react with acids.
- Some metals react with bases to pr[illegible] hydrogen gas.
- More reactive metals displace less re[illegible] metals from their compounds in aq[illegible] solutions.
- Metals and non-metals are used wid[illegible] every day life.

Exercises

1. Which of the following can be beaten into thin sheets?
   (a) Zinc (b) Phosphorus (c) Sulphur (d) Oxygen
2. Which of the following statements is correct?
   (a) All metals are ductile.
   (b) All non-metals are ductile.
   (c) Generally, metals are ductile.
   (d) Some non-metals are ductile.

Materials : Metals and Non-Metals 53

Evaluation can be done after completing each section. Always encourage the child to write or express verbally in his/her own words. Make them fill the graphic organizer. Provide them pictures to come up with answers.

Physical properties of Metals

Look	*Sound*	*Feel*	*Beaten into Sheet*	*Drawn into wires*	*Conducts Heat*

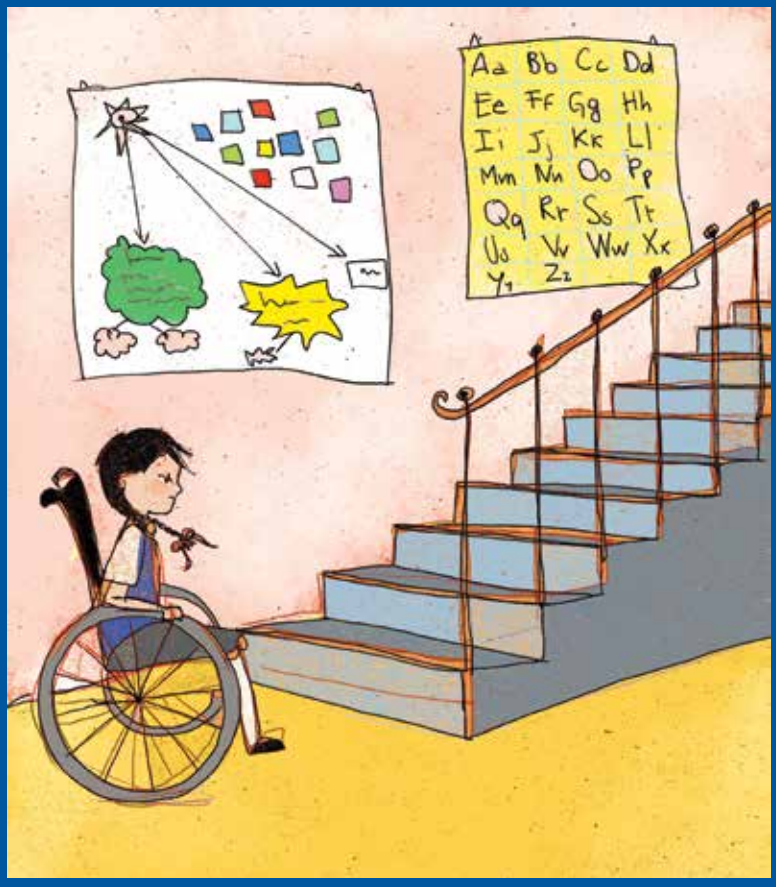
Sample questions

Fill in the blanks

1. How a materials looks, sound and feels is called its _____ property.

2. Non metals are _____ conductors of heat.

Physical Disabilities



Physical disability[43] means loss (partial or full) of bodily functions like walking, speech, fine motor skills, bladder control, hand movements etc. It may be present at birth or may develop later due to an accident, injury or disease. A child may have one or more disability. The disability may be visible like loss of limbs, or hidden like epilepsy. Children having the same physical disability may have different abilities and may require different interventions. Physical disability may also affect other functions in the child, like speech, communication and language, sensory functions, cognitive development, social and emotional development, activities of daily living and self-care etc. When a child has several different disabilities he/she is said to have multiple disabilities.

Students with physical disabilities may require a number of adaptations in the physical environment and teaching depending on the level of support needs and functioning. What is important is that the child should not be left out of any activities which are enjoyed by other students, including engaging the child in sports and other cultural activities.

In this section, we highlight the need specific adaptations for children with physical disability that will enable them to participate in the classroom activities and learning process along with their peers:

43 *This section has been prepared with support from Action for Ability Development and Inclusion (AADI), New Delhi.*

Specific Needs	Tips and Strategies for Inclusion of Children with Physical Disabilities
Physical and Motor Functions Mobility restriction in exploring the environment and learning from it	Proper positioning and seating arrangement – The child should not be sitting on the chair/wheelchair without a straight back or with a rounded back, with body sliding out of seat, with body leaning on one or the other side and head leaning to the side, front or back. Levelling of all areas of school with ramps. If this is not possible, the school must get the classrooms, library, labs etc. on the ground floor.
Hand Functions ▫ Turning pages ▫ Keeping the paper steady ▫ Project work involving use of hands ▫ Writing work ▫ Taking out books from bag	▫ Provide paper clips to hold papers and other materials in place, large felt-tip pen for writing, reading stand to support the materials is useful. ▫ Use raised edges of the tray or the table to prevent material from falling due to involuntary movements. ▫ Use cork board to stabilise the sheet with thumb pins or tape the sheet to tray. ▫ Organize small group activities with complimentary abilities. ▫ Encourage peer support for placing material on the table. ▫ Use carbon paper, oral expression (dictating answers and Multiple Choice Questions can be used). ▫ Give extra time and support for completing the work. ▫ Allow audio recording of the lesson. ▫ Allow use of scribe or peer for writing as also computer technology, screen reading software, adapted keyboard with big keys, switches for navigation instead of a mouse.
Speech Functions For example, speaking with only eyes and gestures	Use direct eye contact, alternative communication devices, communication boards, pictorial representations of lessons— pictures and illustrations accompanied by words etc. (The level of complexity of words would depend on the intellectual level of the child.) Allow use of technology to process speech output, software which can be installed on computers, and can be used in place of speech output.

Specific Examples

Language

- **Concept of prepositions (like up and down)** – All children, including the child with disability, can learn better by direct experience along with verbal inputs, but for child with physical impairment, his/her opportunity to get the experience of going up and down may be limited. The teacher may have to actually sit with the child and slide down with him/her (combined with language input).

Concepts such as "up-down" may be explained through demonstration. A teacher may hold a child with disability sitting on a slide and come down with him / her to demonstrate the meaning of up and down.

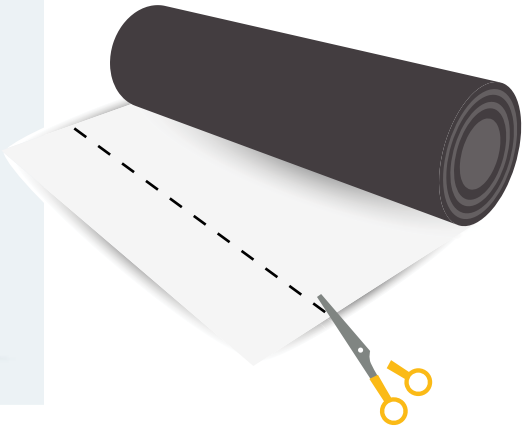
Social Sciences

- **For making maps,** (including political, vegetation etc.) use cooperative learning with small groups (3-5 students). The groups should be of mixed abilities to make cooperative learning effective. Use peer tutoring when a child with physical disability needs support in understanding various concepts and facts.
- **Indicating places in Geography** – For a child with limited hand movements, the given map or globe model should be of large size. Names of places should be written in bigger print and space. Cut outs of States can be made for the child to pick it up to label the right answer. Exercises where a child says the name of a State by pointing at a place and another child nods yes/no can be tried.

- **Teaching Class VII, Subject — Social and Political Life. Chapter 5 Women Change the World** — In case of child being unable to draw, the teacher should provide drawings or images as teaching aids to make a concept clear. Pictures of Teacher, Farmer, Factory worker etc. can be given and the child can be asked to tick mark on the images of men and women in different kinds of jobs. Provide jumbled up written strips of possible discussion points on this issue and ask the children to arrange them in order. The answers can be put in jumbled up written strips and the child can be asked to choose the correct one.

Mathematics

- **Geometry**, which requires use of scale etc. may be difficult for children with hand function problems. Scale and geometric instruments with pegs on top to hold and metallic measuring tape would help.
- For children who have difficulty in making a bar graph, strips of paper cut-outs can be given.



- **For assessing fractions**, the child can stick cut-outs instead of drawing it[44], or s/he can choose the correct answer from a diagram as given below:
  Q: What is a triangle?
  Ans:

Yes/No

Yes/No

44 *A measure of learning is determined not only by written output. Each child learns at his/her own pace so it is important to let the child learn at his/her level and not compare with other children.*

Q: What is a circle?
Ans:

Yes/No

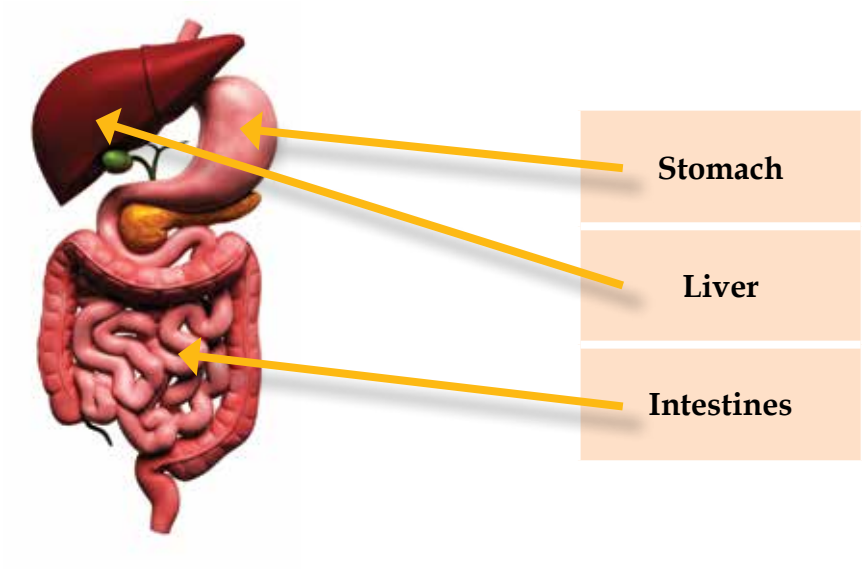
Yes/No

Science

A child who has difficulty in manipulating the pencil and hence cannot make diagrams would need to be given an alternate question where s/he just has to choose, say the correct answer or label a given diagram. For example, instead of asking the child to draw and label parts of the digestive system, the child can be given a pre-drawn diagram/carbon copy of the digestive system with key words to match appropriately as shown below.

To know whether the child has understood the process of digestion, we can use strips of cards with steps of the process written on each card and the child can arranges it in a sequence.

Match the parts of the digestive system with the given labels.



Continuous and Comprehensive Evaluation in Inclusive Classrooms

One must be considerate about the individual's impairment but it cannot be an excuse for poor or unacceptable performance.

If you are a teacher, you may be often bothered whether students are actually learning as a result of your efforts. It is possible to get some idea, looking at students' faces or participation, but when you give a test later, it may turn out that their learning is inadequate or faulty or only some students could progress the way you desired. If you do not see desired results of your work, you may feel dejected and frustrated. It is often too

late to correct the situation if the class has moved on to later topics. At times, the later topics are also not learnt fully well, since the previous learning has not been strong enough.

What can you do to save yourself from this constant stress? It is being realised the world over that using assessments formatively is one way to save the teacher from this frustration and help her/him in actually making learning better. The evolving newer approach to overcome this problem came to be known as CCE (Continuous and Comprehensive Evaluation)[45].

If properly understood, evaluation or assessment[46] will not be perceived as simply something administered by the teachers and taken by the learners on the conclusion of a period of learning. When evaluation is seen as an end of the learning exercise, both the teachers and the learners will tend to keep it outside the teaching-learning process, rendering assessment broadly irrelevant and alien to the curriculum. Further, such a perception associates anxiety and stress with evaluation for learners. On the contrary, if evaluation is seen as an integral part built into the teaching learning process, learners will not perceive tests and examination with fear. It will lead to enhancement of learning.

The scope of evaluation in school extends to almost all the areas of the learners' personality development and is comprehensive in nature. Evaluation reveals the strengths and weaknesses of learners more frequently, and provides a kind of roadmap that allows every student in the class to be successful so that the learners have better opportunity to understand and develop their learning. It also provides feedback to the teachers for modifying their teaching strategies inspite of the fact that no two students are the same, and no individual student with or without disability has the same response to learning in any given situation. What is considered a disability in one situation may be a difference that enriches learning experiences of all children. The following table summarises key differences between assessment and evaluation.

45 *Source: CCE Primary Package. Retrived from: http://www.ncert.nic.in/departments/nie/dee/publication/report.html NCERT*

46 *Difference between Assessment and Evaluation is given in the first section.*

Table 1: Key Differences between Assessment and Evaluation[47]

Content	Assessment	Evaluation
Content: timing, primary purpose	Formative: ongoing, to improve learning	Summative: final, to gauge quality
Orientation: focus of measurement	Process-oriented: how learning is progressing	Product-oriented: what has been learnt
Findings: uses there of	Diagnostic: identify areas for improvement	Judgmental: arrive at an overall grade/score

Thus, assessment is a useful, desirable and an enabling process. After the Right to Education Act (2009), the composition of our classrooms is changing. More and more students with diverse intelligences, talents, skills, interests, and backgrounds enrich our schools. Many of today's classrooms are more diverse than ever before. With such variations in abilities existing in the classrooms, teachers also are realising that no one style of teaching would work. Without adaptations, some students would never be motivated, while others may never experience success. Following are some issues that need to be kept in mind while carrying out evaluations in an inclusive classroom that has children with disabilities:

- Working memory (short term memory)
- Learning Styles, for example, visual, auditory
- Problems in certain skills, for example, reading, writing, listening, speaking
- Time, for example, for thinking, reading, writing etc.
- Self-esteem and motivation
- Anxiety and stress
- Gaps in Learning (if needs are not met)

We know that all teachers are required to assess the students regularly in the class and this is not an easy task, though the most important one. **The learning outcomes given in the earlier section can be used as a checklist but should not dictate the classroom processes.** For example, teacher should have the flexibility to vary the order in which the syllabus is taught, how it is taught and which outcomes are achieved. S/he should also understand that every assessment is valuable as it drives individual teaching and learning. The following are some Do's and Don't's of Assessment in an Inclusive Classroom.

47 *Source: Classroom Assessment Techniques Content adapted from: Angelo, T. and Cross, K.P.1993. Classroom assessment techniques a handbook for college teachers. Jossey-Bass A Wiley Imprint, San Francisco, CA. Pp 427*

DO's	DON'T's
▪ Identify what the student already knows and has learnt. ▪ Focus on abilities, strengths and needs. ▪ Recognise that learning styles differ and children respond in variety of ways. Assessment should include variety of tasks. ▪ Let the student be actively involved in his/her own assessment process. ▪ Focus on learning, not on marks, and provide opportunities for students to critically reflect on their progress. ▪ Use a variety of ways to present[48] and collect information about the learner's learning, for example, through role play, drama, posters, audio recordings etc. ▪ Be flexible about time, if required. ▪ Be sensitive to every learner's response. ▪ Provide constructive feedback that will lead to positive action and motivate the learner. ▪ Encourage students to identify which strategies were beneficial for their learning and which were not.	▪ Making comparisons between children. ▪ Labelling learners as slow, poor intelligence, hopeless etc. ▪ Making assumptions or stereotyping individuals and/or group of students. For example, children with VI can do this and cannot do that. ▪ Highlighting weaknesses and deficits and making negative statements. ▪ Asking questions about two or more things at once. ▪ Asking questions based on rote memory. ▪ Believing that one size fits all, and not being flexible. ▪ Lengthy questions giving little time for actual thought. ▪ Being inflexible in terms of time, number of questions, modes of answering etc. ▪ Practising weekly tests in the name of continuous assessments in all the subjects. ▪ Reporting formative assessment in every quarter (like terminals). ▪ Combining various aspects of child's behaviour in isolation from the curricular learning.

48 *Presentation can be verbal or visual and may involve large size pictures or print.*

DO's	DON'T's
▪ Encourage cooperative learning activities where every student is seen as an equal in human dignity. ▪ Integrate the child's everyday routines, interests, materials, etc. within the assessment process. ▪ Use technology like computers, tape recorders, voice synthesisers as per the needs of the child. ▪ Use devices like calculators, Abacus, Brailler, Taylor frame, communication board, Slant boards, pencil/pen grips etc. ▪ Act as a facilitator providing various learning opportunities. ▪ Consult parents and other relevant people.	▪ Dividing curriculum into curricular (Maths, Languages, Social Sciences and Science) and co-curricular areas (Arts Education, Health and Physical Education, Work Education). ▪ Giving marks first and then converting into grades. ▪ Viewing students as a passive recipients of assessment. ▪ Focusing on learning outcomes only. ▪ Carrying out assessment in isolation; for example, by a special educator.

Formative and Summative assessments that promote group work can create a safe environment for students to integrate and participate, help students get to know each other, build a group — not an audience, allow different styles of contribution to be valued.

Source: Rodriguez, Falcon, E. Evans, M. Allam, C.Barrett, J. & Forrest. 2010. *The Inclusive Learning and Teaching Handbook.* University of Sheffield.

Some Examples of Formative Assessment

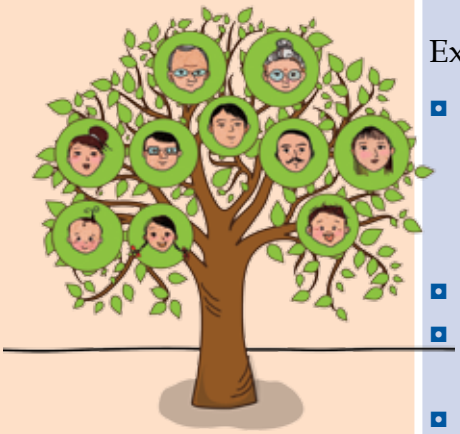
Language Tools for Formative Assessment[49]	Additional Tips and Strategies for Inclusive CCE
▫ Oral and listening — listening comprehension, prepared speech, conversation or dialogue. ▫ Written assignments – short and long question-answers, creative writing, reports, newspaper articles, diary entries, poetry etc. ▫ Speeches – debates, oratory, recitation, extempore, narration, description etc. ▫ Research projects. ▫ Pair work/group work. ▫ Peer assessment.	▫ Using multiple modes of evaluation through visual, audio and kineasthetic medium. ▫ Matching the Words with Pictures/ Words. ▫ Giving pictorial cues for answering. ▫ Making posters, cartoons , paintings, labeling pictures, pointing etc. ▫ Assessing through who, when, what, where questions. Example: Where was Kalpana Chawla born? When did she go to the U.S[50]? ▫ Fill in the blanks with multiple choices of words/ suggestive words, phrases etc. Example: Wind is ___air (travelling, shifting, moving, relocating, and progressing)[51] ▫ Learners framing questions on the lesson. ▫ Using dramatisation, enacting poems, debates and small quizzes, crosswords. ▫ Asking questions focusing on one thing at a time (if required). ▫ Use of Worksheets, for example, knowledge of punctuation marks can be assessed through sample worksheets in print and Braille. ▫ Substituting questions based on pictures, if required. ▫ Providing a scribe, if required. ▫ Evaluating during classroom teaching.

49 *CBSE (2010). Continuous and Comprehensive Evaluation: Manual for Teachers: Class VI-VIII. New Delhi, India. (http://www.cbse.nic.in/publications/CCE_Manual_Class_VI_VII_2010.pdf)*

50 *Honeysuckle, Class VI, Classic English Textbook, Chapter 4: An Indian American Woman in Space: Kalpana Chawla.*

51 *Honeysuckle, Class VI, Classic English Textbook, Chapter 8: A game of Chance.*

Social Sciences Tools for Formative Assessment	Additional Tips and Strategies for Inclusive CCE
▫ Written assignments – short and long answers, brief reports, write up ▫ Commentaries ▫ Source-based analysis ▫ Projects - investigative, informative, deductive and analytical ▫ Research ▫ Group work - projects and presentations ▫ Models and charts ▫ Presentations, including the use of Information Technology ▫ Visits to sites ▫ Exhibitions	▫ Emphasise only useful description of the content/concept. ▫ Use exercises like matching pictures with important names (for example, of monuments). ▫ Using true and false, fill in the blanks, multiple choice questions, comparisons & differences. Example: Comparison between metamorphic rock and sedimentary rock or difference between Lok Sabha and Rajya Sabha ▫ Use maps that are enlarged or highlighted ▫ Use poster making activity as a group task (groups need to be diverse) ▫ Events in sequence, or names of rulers stating the dates of events can be assessed by making use of family tree, flash cards or timeline. Example: ▫ Use of time-line or family tree Mauryan empire… 2300 years ago Great Wall of China… 2400 years ago. ▫ Use skits and slogan writing ▫ Use role play/*nukkad nataks* on a given topic ▫ Organising Mock situations like Parliament, model *Panchayat* ▫ Undertake field visits, photography and filling questionnaires



Family Tree

Mathematics Tools for Formative Assessment	Additional Tips and Strategies for Inclusive CCE
▫ Problem solving, Multiple Choice Questions (MCQs) ▫ Data handling and analysis ▫ Investigative projects ▫ Math Lab activities ▫ Models including origami etc. ▫ Research projects and presentations ▫ Group projects ▫ Peer assessment ▫ Self-assessment ▫ Students' notebooks and portfolios ▫ Presentations including the use of Information Technology (IT) ▫ Discussions ▫ Quizzes ▫ Observations	▫ Using multidimensional approach including spoken language, manipulatives (card paper/blocks/ straws/matchsticks), pictures, real life situations and symbols in written form, role play, stories, play and fun activities , games and puzzles, tactile representations, models, embossed graphs; etc. ▫ Making use of cooperative learning activities. ▫ Carrying assessment by converting word problem into equations with pictures. ▫ Varying length (but not competence in content area), time and degree of difficulty level of questions, if required. ▫ Using tally marks for frequency counts. ▫ Using assistive devices like calculators/talking calculators, Taylor frame, abacus, Brailler, geometical kit etc. ▫ Using assessment sheets/ worksheets transcribed in Braille.

Science Tools for Formative Assessment	Additional Tips and Strategies for Inclusive CCE
▫ Written assignments, MCQs ▫ Experimental work ▫ Planning or designing experiments ▫ Research work ▫ Group work and peer discussions ▫ Contextual research projects ▫ Peer assessment ▫ Self-assessment ▫ Presentations including the use of IT ▫ Science Quiz ▫ Seminars ▫ Symposium ▫ Field Tours ▫ Class Response ▫ Model Making ▫ Students asking questions	▫ Making use of Multi-sensory modes — auditory, visual, tactual, taste and smell. ▫ Using diagrams (tactile etc.), tables, pictures for labeling, charts and mind maps, concrete experiences/objects, models, graphic organizers, oral questions, flow charts, discussions. Example: Harmful Microorganism (Science Textbook for class VIII, Chapter 2, Microorganisms : Friend and Foe, pp. 22. ▫ Using substitute questions for diagrams, tables, maps etc. or questions based on verbal descriptions. ▫ Assessing through MCQs, matching exercises, fill in the blanks, true or false, short questions. ▫ Organising assessment with peer support. ▫ Using assistive devices like tactile boards, tactile measuring tapes, scales, large prints, Braille worksheets etc.

Disease	Symptom	Caused By	Prevention

The above section describes various strategies for CCE that can be used in an inclusive classroom. Cooperative learning is a useful teaching strategy that develops both positive interdependence, which means that no student can succeed without the help of another and individual accountability. Assessment activities can be implemented at different stages of the cooperative learning and can be conducted by either the teacher, the student, or group peers.

By using **Learner Groups**[52] children with different abilities collaborate and co-operate with each other in order to meet the learning needs. These settings are generally used for:

Introduction: They share understanding of concepts (including key information) and consolidate understanding of concept as it relates to the theme. Use oral and written forms, use body langauge in communication (Example, express mime etc.)

Exploration: They develop a shared understanding of an aspect of the concept by engaging with tasks, situations and people and by empathising with others.

Reflection: They engage with the aspects of the concept through collaborative activities — projects, group discussions, charts, essays, peer reflections etc.

Teachers are still struggling to gain conceptual clarity and practical understanding of what CCE is. They are diluting the essence of CCE by merely conducting daily tests. During an interview, a teacher took pride in announcing that he had conducted 150 tests in a single academic year. For most teachers, CCE is all about conducting a test every day. Another teacher said that CCE is like any other scheme which will not last long.

52 *Source: Rajiv Gandhi Foundation. Learning Manual for Teachers. Kalika Yatra Programme, Government of Karnataka.*

UNIVERSAL DESIGN FOR LEARNING

Diverse strategies of teachers for teaching content	verbal, visual, kinesthetic, written, proceeding from simple to complex, concrete to abstract, step by step, scaffolding, concept maps, project and group work, peer tutoring, using prior knowledge, brainstorming, dramatisation, giving extra time, giving alternative activities, drill activities, shortening assignments, organising excursions/trips, using large fonts, Braille or tacitly coded material, toys, blocks, carbon or xerox copy of notes, hand puppets, real life experiences, real objects, multiple choice questions, children's literature, magazines and journals etc.
Diverse ways of expressing learning by students	oral, written, tactual, gestures, drawing, acting, ICT, framing questions, paired reading, storytelling, song, rhymes, role play, discussions, debates, language games, flash cards, quizzes, graphic organisers, outlining passages, highlighting, and paper cutting/folding, etc.
Supplementary materials used in teaching	artifacts, calculators/talking calculators, Taylor frame, Abacus, Brailler, geometrical kit, Geo-board, Tactile board, Geometric shape board (for circle, graph, representation), Tactile graph sheet (for bar-graph, histograph etc), 3-d blocks and figures, manipulatives, flash cards or pictures on paper, posters, chalkboard, projection screens, computers, books on tape and computerized text reader, screen readers, voice synthesis, scanners, daisy books, multimedia gadgets like CDs, MP3s, talking watches and talking clocks, videos/movies, modeling material like clay, textured objects and raised line paper, games and puzzles, etc.

Notes

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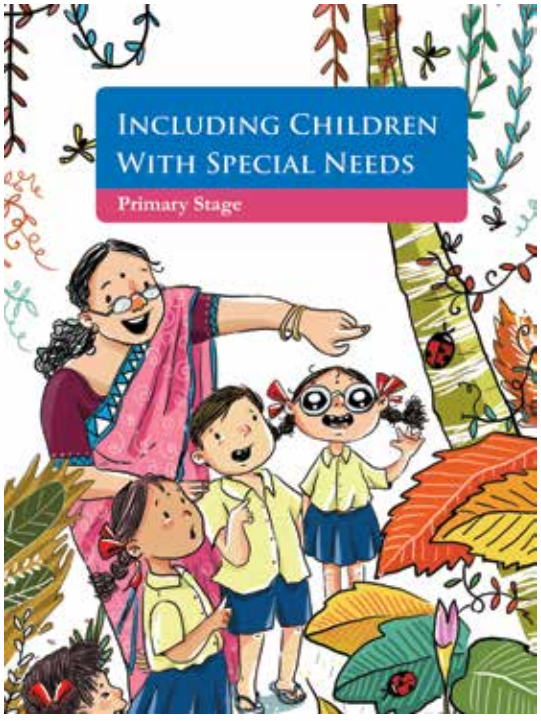

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Primary Stage

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