Main Index

SMALL SCIENCE

Teacher's Book
Class Three

Developed by:
Homi Bhabha Centre for Science Education
Tata Institute of Fundamental Research

Homi Bhabha Curriculum for Primary Science
Pilot Version

SMALL SCIENCE

Teacher's Book
Class Three

Jayashree Ramadas

Homi Bhabha Centre for Science Education
Tata Institute of Fundamental Research, V. N. Purav Marg, Mankhurd, Mumbai 400 088.

Small Science
Teacher's Book
Class Three
Pilot Edition 1998

author
Jayashree Ramadas

general co-ordinator
Arvind Kumar

research assistance
Ritu Saxena

primary science co-ordinator
Jayashree Ramadas

design and illustrations
Poornima Burte,
Student Designer,
National Institute of Design,
Ahmedabad.

published by
Homi Bhabha Centre for Science Education,
Tata Institute of Fundamental Research,
V. N. Purav Marg, Mankhurd,
Mumbai 400 088.

printed by

GENERAL PREFACE

The Homi Bhabha Centre for Science Education (HBCSE) has been active in research and field work since 1974. Interdisciplinary scholarship at the Centre has been developed around a doctoral program in Science Education. As one outcome of this research and development, about ten years ago, textbooks, workbooks and teacher's books in primary science were brought out by HBCSE.

The books received warm and appreciative response from all quarters - teachers, students, parents, professionals and also Government agencies. At the time of first publication some of the ideas in these books appeared radical and unconventional. Today these ideas have become part of the discourse of education in our country. We are therefore very happy that the Oxford University Press has taken on itself the job of publishing and distributing these books on a much wider scale.

The National Curriculum Framework 2005 has prepared five guiding principles for curriculum development: connecting knowledge to life outside the school; ensuring that learning shifts away from rote methods; enriching the curriculum so that it goes beyond textbooks; making examinations more flexible and integrating them with classroom life; and nurturing an overriding identity informed by caring concerns within the democratic polity of the country. Often however there remains a gap between the generally agreed objectives of the curriculum and their actual translation into textbooks and teaching practices.

The books brought out by HBCSE reflect an attempt to close this gap as much as possible. It is for the users of these books to decide if this attempt has been successful.

Arvind Kumar

Main Index

Preface to Small Science: Class III

The series of students' and teachers' books for the Homi Bhabha Curriculum are the outcome of more than two decades of research and field experience at the Homi Bhabha Centre for Science Education (HBCSE). During these years, several projects have been undertaken to study problems related to pedagogy, students' conceptions, communication in the classroom, text and picture comprehension and cross-cultural issues in science learning. All the members of HBCSE, past and present, have in some way contributed to this curriculum.

The curriculum for primary science is largely inspired by observations made during a three-year research project at HBCSE, "Diagnosing Learning in Primary Science." The problem addressed by the curriculum is briefly as follows.

Primary school students, particularly in rural areas, have rich, interactive experiences of the natural world. But lacking systematisation and clear expression, their observations and skills do not contribute to school learning. Urban students from literate homes, on the other hand, are often encouraged to ignore their natural surroundings, and to concentrate on meaningless bookish learning. As a result, most students miss out on the concrete experiences of systematic observation and self-expression, so vital to science learning through the rest of their lives.

The books for Class III have few facts to remember. Unit 2 is the only one where the information content is important. The other three Units aim simply to provide experiences. To use these books, students must get out of the mind-set of copying the correct answers from the blackboard or from other students. Small Science should not be just read, it should be done.

The Hindi and Marathi versions of these books are under preparation. Any good curriculum should be dynamic, ready to face criticisms, and to change according to the needs of students and teachers. Please send us your ideas and suggestions in the feedback form provided at the end of the WorkBook.

Jayashree Ramadas

Main Index

Acknowledgements

I would like to thank:

Arvind Kumar who initiated the Homi Bhabha Curriculum and gave constant encouragement

Ritu Saxena whose dedicated work improved all aspects of the TextBook and Teacher's Book

Amruta Patil and Aparna Padmanabhan who helped in the teaching

The principals and staff of the Children's Aid Society and the Atomic Energy Central Schools who willingly accommodated us and gave useful feedback, and the children who enthusiastically participated in the trials

Poornima Burte who, did the format and design and contributed ideas for stories and poems

Chitra Natarajan and K. Subramaniam who read the drafts and cleared some cobwebs in my thinking

Other colleagues who attended the curriculum sessions and gave important suggestions on the draft versions: Bakhtavar Mahajan, G. Nagarjuna, Kala Laxminarayan, Porus Lakdawala, Savita Ladage, Sugra Chunawala and V. G. Gambhir

P. R. Fadnavis, C. S. Pawar and others who provided administrative support

N. S. Thigale and G. Mestry who helped in producing the drafts

M. M. Johri and K. S. Krishnan of the Tata Institute of Fundamental Research, A. J. Tamhankar of the Bhabha Atomic Research Centre, Isaac Kehimkar and Prashant Mahajan of the Bombay Natural History Society and Parvish Pandya of the Bhavan's College, who gave expert advice

My husband, Ramadas and children, Rohini and Harishchandra, who were both supportive and devastating in their criticisms

Jayashree Ramadas

Main Index

Contents

Introduction

A WORD ABOUT THE FORMAT

There are two students' books for each class: The TextBook and the WorkBook. The WorkBook provides space for recording the results of activities, and for the written part of the exercises given in the TextBook. The WorkBook is to be used by the teacher for continuous evaluation of the student's work. There is then no need for any separate notebooks for science. For the teacher, there is a separate "Teacher's Book": in a sense the most important of these three books. It includes the contents of the TextBook, with a manual on classroom teaching.

The large number of activities and exercises in the students' books are made possible because the topics to be studied in one year are fewer than usual. In this way, repetition of topics over the classes is also avoided. The topics are simpler, but they are to be studied in depth. The teachers' manual provides practical help and advice on how to do this.

This manual is written in the first person. It summarises our collective teaching experiences in different schools, with children from several different backgrounds. Your own experiences too can add to the books. Please do write and tell us how you like the books, and whether you find the ideas in them workable. We would be very happy if you try out this curriculum and let us know the results.

WHAT THE CURRICULUM IS ABOUT

Curiosity and learning

Children are by nature curious and observant. They learn about the world by watching, asking questions, and trying to make sense of what they experience. Science teaching should aim to encourage these natural tendencies. Hence this set of students' books, which have more questions than answers. These questions are an opportunity to involve the class in observations and discussions.

Traditional schooling has always trained students to *answer* questions - to come up with one correct response which satisfies the teacher and examiner. As a result however, students never learn to *frame their own questions*. They also do not learn to judge when a question has been answered satisfactorily.

In the Homi Bhabha Curriculum, we do not want students to simply parrot out a few correct answers. We want them to develop a lively curiosity about the world around them - with a will to pursue these questions through observation and inquiry. If they have this curiosity, they will learn, and become creative human beings too.

The textbooks interweave a story about two curious children, Mini and Apu, who learn many things by doing and asking questions. The text which follows encourages students to observe the world around them, to seek answers to questions, and to raise their own questions.

At the primary school level, most of the facts that students need to know exist in their surroundings, and often in the knowledge of older people. They can be found out through questionning and systematic experiences. A large number of such facts will be discussed and discovered in the course of this curriculum. Young children are hungry for new facts, new information. It is important that we whet their curiosity and develop in them a love for learning.

Science and basic skills

The aim of science teaching is to introduce concepts and ways of thinking that will help students interpret their experiences of the natural world. Science teaching should also provide new experiences, and enhance students' ability to enrich their own experiences.

The ability to gain and to interpret new experiences develops through the exercise of some basic skills related with:

1. design and engineering
2. language
3. quantitative thinking

This science curriculum supports the development of these basic skills.

1. Design and Engineering

For too many years, this has been a weak point in Indian education. Students must start to use skills of drawing and constructing spontaneously in learning concepts. They should develop an attitude of "let's do it and see"! Learning comes out of a willingness to experiment, visual-spatial ability to design a situation, and manual dexterity to carry out one's plans. The curriculum offers many opportunities for students to construct with their hands, to put down their observations in drawing, and to develop simple concepts of design.

2. Language

Primary school children are actively developing their language ability. Language is a tool that will help them to conceptualise, to understand, and to express their thoughts. Language and expression is to be developed not just in language classes, but through the entire primary curriculum, including science and mathematics.

Throughout the curriculum, students apply their verbal and quantitative skills for more effective observations and inference. They also learn to communicate science knowledge.

3. Quantitative thinking

Quantitative thinking is to be developed not just in mathematics classes, but through the entire primary curriculum, particularly through science. Number skills will in turn help concept-formation in science. For this reason, activities involving quantitative estimation are included in the TextBook. A Unit on Measurement brings together number and design concepts.

Concrete now, abstract later

Abstractions are central to science. As students grow older, they will be introduced to many new abstract concepts: often these create formidable difficulties in science learning in the later years. However, first-hand concrete experiences at a young age greatly strengthen the student's capacity to construct abstract formulations later on.

For example, observation of living things in their environment will serve as the basis for later biological concepts of structure and function. Simple measurement experiences will lead

to understanding of basic physical quantities and the notion of units. Concrete experience of building with clay will gradually contribute to development of varied abstract concepts such as conservation of matter, properties of materials like density and elasticity, physical and chemical changes, and many others.

The large number of activities in the TextBook for Standard III do not merely serve to make the content more interesting. Besides developing experimental skill, they enable students to gain those concrete experiences on which later abstractions will be based.

The activities are therefore an integral part of the curriculum. They cannot and must not be omitted. Subsequent portions of text, as well as many evaluation exercises, depend on successful completion of the activities.

Values in science

The TextBook and Teachers' Book try to convey certain values, like caring for living things, conserving resources, community living and working with the hands. They also introduce the idea that scientific enquiry into the external world does not exclude a role for feelings and emotions. As much as possible, these values are conveyed implicitly.

Assessment

Young children love to learn facts about the world. But, children at this age also have short memories! It will be unrealistic to expect from them a total recall of facts. The assessment in this curriculum therefore does not emphasise factual knowledge. Rather, the assessment focuses on four aspects:

1. observation of environment
2. design and engineering skills
3. oral and written language
4. quantitative thinking

There are to be no unit tests or final exams. The assesment is continuous, based on the student's writing in the WorkBook, as well as on their performance in the construction activities and oral exercises. Space is provided in the WorkBook for recording these grades. The supplementary exercises suggested in the Teachers' Book may be used as needed.

Opportunities for expressing one's own ideas and experiences are rare in our schools, which is one reason why language ability, even in Class Three, is often poor. While correct language should be introduced to students, credit should be given for accuracy of observations and originality of ideas, rather than for spelling or grammatical correctness. We expect this evaluation to provide a learning opportunity and not just to convey a verdict of pass/ fail.

HOW TO TEACH THE CURRICULUM

This curriculum proposes many new ideas; consequently we expect that many new situations will arise in the classroom. Some sample situations are discussed in the manual, but it is not possible to do this exhaustively. Ideally, the curriculum should be implemented by a group of teachers in one school or in a group of schools, who meet frequently to discuss their ideas and problems.

The stories

The stories should be read out in class, while students follow in their own books. These stories and poems are meant to arouse interest, and to raise students' curiosity about the topic. The stories often teasingly point ahead to ideas that the students would learn in later classes. Sometimes they are even a little difficult for all students to understand completely.

The language level of the poems may also be a little beyond the level of some students. The unfamiliar words in the stories and poems should be explained, but their scientific aspects need not be spelt out in detail. Evaluation questions also should not be based on them. These stories and poems are to be read "just for fun".

The activities

The activities are all to be done in school time, except in a few cases where students are asked to make some observations at home. Before doing any activity, spend some time in the previous lesson explaining what the students are going to do, and what they might need to bring from home. Prepare the materials, and plan how the class will be organised - at their seats or working in groups; inside or outside the class room.

Space is provided in the WorkBook for recording the results of activities. Exercises which need to be done during the activities, or immediately following them, are indicated as such in the manual.In the lesson following the activity, summarise what the class did and what they found in the activity. *Ask a question* should always be done with each activity. Even though each student will not come up with a question every time, this will provide enough opportunity through the year for all students to think of a few questions.

Field trips

It would be good to take the students outside the school twice in the year, once for teaching Unit 1 (observing living things) and once for Unit 2 (vegetables and fruits). In these occasions you should get one or more additional teacher, or some of the parents, or a helper, to accompany you. You should explain the purpose of the trip beforehand to the students as well as to the helpers.

The summary

Remember this

These are the facts that students have to remember. The number of facts varies from chapter to chapter. Unit 2 has the maximum number of facts while Unit 3 is entirely activity-based, with no facts to remember. Blackboard layouts are given where more facts are to be presented.

Know these words

Many new words are introduced in each chapter, which you will need to explain. Remember that the meanings should not be given in a formal way, as in a dictionary. It is important for students to learn to use the words in sentences, not to reproduce the definitions. You may even tell the meanings in the local language, and then ask students to use these words in an English sentence.

The exercises

The exercises call for independent work by the students. They may need some explanation, or help with spelling or expression. But please do not ask students to copy standard answers from the board.

Observation-based exercises

1. Drawing tasks (*Name and Draw*)

These tasks are meant to encourage close observation (for example, drawings of different kinds of trees and animals, drawings of a growing plant, of houses). The important point here is that students' drawings should not be copies of standard drawings, but should actually depict their observations.

Perhaps the drawing teacher in your school might be willing to help students in making simple drawings by observation. Some of these tasks could then be done in the drawing class. Children, and teachers too, are sometimes inhibited because they feel they "can not draw". Starting at this young age, it should be possible to overcome such fears, so that students use drawings as a tool for learning and thinking. In the sections on blackboard work, some simple drawings are given which you may like to illustrate on the blackboard.

2. Similarities and differences (*What's same, what's different and Find the odd one out*)

Exercises involving similarities and differences between a pair of objects or situations should be continually done in the course of actual observations. Finding differences and similarities calls for skills of critical observation and generalisation. Noticing similarities, which involves abstraction, is much more difficult than noticing differences. When choosing examples for this kind of an exercise for Class Three therefore, the two things to be compared should be obviously similar.

In finding the odd one out, if students come up with a valid response different from that indicated in the teachers' manual, it should be accepted.

Language development exercises

1. Look, tell and write, Talk and write, Play with words

In Class III, we expect students to express simple ideas orally and in writing. Over the years, their observations as well as their expression should get more complex. *Look, tell and write* is specifically related to observation activities. Exercises in *Play with words* are aimed at vocabulary development.

Oral expression should come before writing. For *Talk and write* you can call students to the front of the class and ask them to describe their observations or experiences. Guiding questions are given in the Teachers' Book and at times in the TextBook. Although all students would not be able to participate in the talking every time, through the year there should be enough opportunities for all. Where possible, these exercises should be done immediately following the relevant activity.

After the talking, students can write down what they have said. Often, students are trained in school to write set essays on given topics. For example, they might have learnt to write an essay on a cow or a dog. When asked to write about an earthworm that is in front of them, they still try to follow the same format as they used with the cow. In this situation, you should make it clear that their own observations are very important, and these are what they should write. Even students with an initially low level of language development will then start to express their observations.

2. Ask a question, Ask and find out

Ask a question should be done continuously through the year, particularly while doing the activities. Given the freedom to ask questions, students ask many, and many of these are very difficult to answer. The point is however, not to give a cut-and-dried answer, but to use the questions to encourage more and better observation. This manual gives some examples.

The questions in *Ask and find out* relate to things that students can find out by asking their parents or other older people.

Some of the questions may be answerable by you or your colleagues or others. But even if you think that a question is too difficult, get students to think further by making related observations, for example, “where else have you seen this? Are there situations where this does not happen?” Overall, students should get the idea that questions are natural, and help in learning. All questions need not be answered immediately and satisfactorily at any level.

You would always find the need for some information or clarifications. Any questions to which you would like answers, please mail to the Homi Bhabha Centre for Science Education, marking the postcard or envelope 'Homi Bhabha Curriculum - Primary Level'.

Quantitative thinking

1. Count!, Figure it out

Through these exercises, students learn the skill of seriating (i.e. arranging in ascending or descending order), estimating numbers and quantities, and carrying out elementary measurements.

Did you know?

Like the stories and poems, these are meant to arouse interest. No testing is to be done on this information.

Blackboard work

Blackboards are an important and sometimes the only teaching aid in our schools. At the end of each Chapter, blackboard layouts are suggested. They would give you ideas for better visual presentation of the content.

Using the WorkBook

PURPOSE OF THE WORKBOOK

1. For the student

a. To record the results of the Activities
b. To solve the questions in the Exercises

2. For the teacher

a. To assess the student's progress
b. To provide feedback to the student and parents

STUDENTS' WRITTEN WORK

A lot of observation and inference is expected of students. This is to be supported by classroom discussion. The written work follows from the observation, thinking and discussion. From the language point of view, there are three kinds of questions:

1. No written work

For some of the activities, very little or no written work is expected. The titles of these activities are given in the WorkBook, along with a 'Y/N' in the Teachers' Margin. You can indicate here whether the student participated in the activity. Design skills are frequently assessed independent of written work.

Some of the *Talk and write* exercises are indicated as purely oral. Others involve discussion followed by written work. The *Ask and find out* exercises are all oral. Their information can be found out as home-work, and exchanged in a classroom discussion.

2. Single word responses

In most of the observation-based questions related to the Activities and the *Short questions*, only single-word responses are expected. In some places, parts of the sentence are given.

3. Responses in complete sentences

In most of the language development exercises, that is, the *Talk and write*, and making sentences, students are to respond in complete sentences. In *What's same, what's different*, sentence phrases are sufficient. In *Ask a question*, students have to frame a question and write it down. No answers are expected.

STUDENTS' DRAWINGS

The *Name and draw* and other drawing exercises are used to assess observation as well as design skills. Drawings call for an ability to convert a real object or a situation into schematic form. To some extent, students learn here to distinguish the essential from the less essential aspects of a situation.

ASSESSMENT AND FEEDBACK

There are two parts to the assessment and feedback. The first part is the teacher's comments and corrections on the student's written, drawing and practical work. The second part is the Assessment Sheet for every Unit.

Teacher's comments and corrections

Space for comments and corrections is provided in the inner margin of the WorkBook. Whatever the quality of the student's work, the teacher's comments should provide encouragement as well as suggestions for improvement.

Sample corrected pages from the WorkBook

CHAPTER 2

LOOKING AT PLANTS

Our green friends

1. The plants you know

Names of plants I know:

a. Small plants

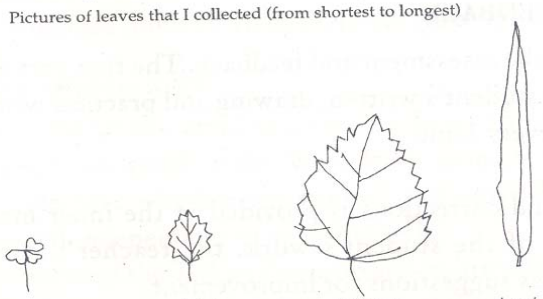
rose	mendi	grass	lily
mogra	palak	cactus	onion
tulsi	baingan	sunflower	fern

b. Tall trees

mango	amla	gulmohr (a)	bamboo
tamarind	pipal	ashoka	jamun
neem	banyan	coconut	lemon

2. Looking at leaves

Pictures of leaves that I collected (from shortest to longest)



clover tulsi hibiscus bamboo

mehndi

bamboo is not a tree

Y N

3. Guess the leaf!

Close your eyes. Guess the leaf, which your friend gives you, by touching and smelling it.

4. Flowers

bougainvilla

a. Names of the flowers my friends and I found:

chameli	bogunvilla	shevanti	red thorn flower
genda	champa	cactus	shoeflower

hibiscus

Y N

b. Play a game: A friend shows you any flower. Guess which plant it comes from.

Y N

money

c. Find plants which never get any flowers.

muny plant	pine	fern	coconut

croton

5. How many children to hold one tree?

Y N

a. Put your arms around the trunk of a tree. How many of you does it take to hold one tree?

b. Name of a tree with a very large trunk: banyan tree near my house

6. Rough and smooth barks

a.

Name of the tree	Colour of the bark	Rough or smooth	Plants and animals found on the bark
Bhendi	chocolate brown	rough	moth, ants, brown beetle
Papaya	grey brown	thick bands	no animals
Banana	yellow green	smooth	wet white powder, spiders

Good! Did you know Banana is not a tree. It is a big herb

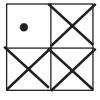
fungus

Assessment Sheet

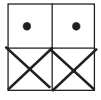
The Assessment Sheet provides a report of the student's progress. The assessment takes into account not only the student's written work, but also oral expression and manual dexterity which the students demonstrate in the classroom. There are three parts to the Assessment Sheet. The first two parts are to be filled by the teacher and the third by the student. The novelty of the grading process should provide some interest as well as motivation to students.

Part 1

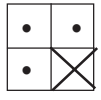
This Part contains ten assessment categories. The first five categories have to be assigned scores. These categories are indicated near the appropriate WorkBook questions with the use of icons. Remember that this classification of the questions is only suggestive. For example, language and observation are tested in almost every question. The final assignment of scores will depend on the teacher's judgement. Against each of these first five categories, there is a group of four squares. Depending on the student's performance on that category, either 1, 2, 3 or 4 of the squares can be marked with a dot.



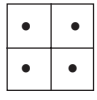
Unsatisfactory



Fair



Good

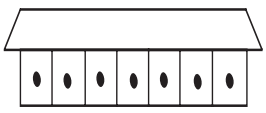


Excellent

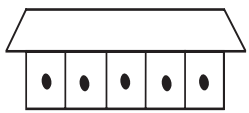
The next five categories relate to students' attitudes and motivation. No grades are given on these qualities, but the teacher's remarks on them are very important, especially for providing feedback to parents.

Part 2

In this part, there are four lines of squares marked 'House 1', 'House 2', House 3' and 'House 4'. The squares in these houses are to be marked by dots from left to right, starting from the top left corner. The number of marked squares should be equal to the number of marked squares in Part 1 of the assessment sheet. Any unfilled house is crossed out.

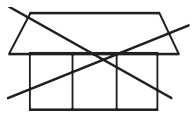


House 1



House 2

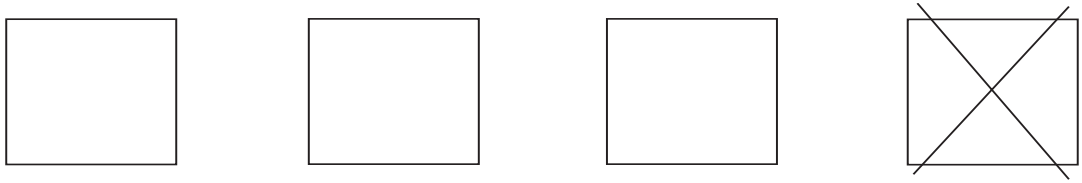
House 3



House 4

Part 3

The dots in Part 2 of the sheet might have reached House 1, House 2, House 3 or House 4. The students have to colour or paste the appropriate materials on that many squares in Part 3, Instructions for the students are given in the assessment sheet. If the dots have reached House 3 in Part 2, the teacher strikes out the fourth house and the student completes the first three squares.



The teacher's record

The number of houses filled is the student's grade on that Unit:
A = 4 houses B = 3 houses C = 2 houses D = 1 house

This record can be kept with the teacher. The complete set of grades for the class would provide the teacher with a measure of his or her own effectiveness in teaching that Unit.

Assessment categories

The assessment categories follow from the aims of the curriculum as stated earlier. In Class 3, language has been assigned the maximum importance in assessment. The weightage for each category varies according to the Unit. The number of chapters also vary. Adding scores for the four units is therefore not recommended.

1. Observation of environment

The observations should be assessed for number, quality and variety. Students should notice details, and show them in both drawings and writings.

2. Design and engineering skills

Assessment of design and engineering skills should include both the 'planning' and the 'doing' parts of manual activities. These activities include drawing, handling plants and animals, measuring and constructing. These skills are tested most prominently in Units 3 and 4.

3. Oral language and **4. Written language**

In questions where the primary focus is language development, responses are expected in complete sentences. Vocabulary is tested in many of the observation questions involving single-word responses.

Assessment of oral language should consider the student's confidence and coherence. Clarity of expression is important in both oral and written work. In reporting observations, students should use descriptive adjectives and adverbs.

5. Quantitative thinking

Although every Unit has activities involving counting and seriation, quantitative skills are most prominently tested in Unit 3. Accuracy of responses is of course important, but so is a general tendency to think and to frame questions in quantitative terms. This should be encouraged whenever seen.

6. Enthusiasm in doing activities and **7. Patience and concentration**

Students should be enthusiastic in tackling new tasks, but also be capable of periods of quiet, concentrated work.

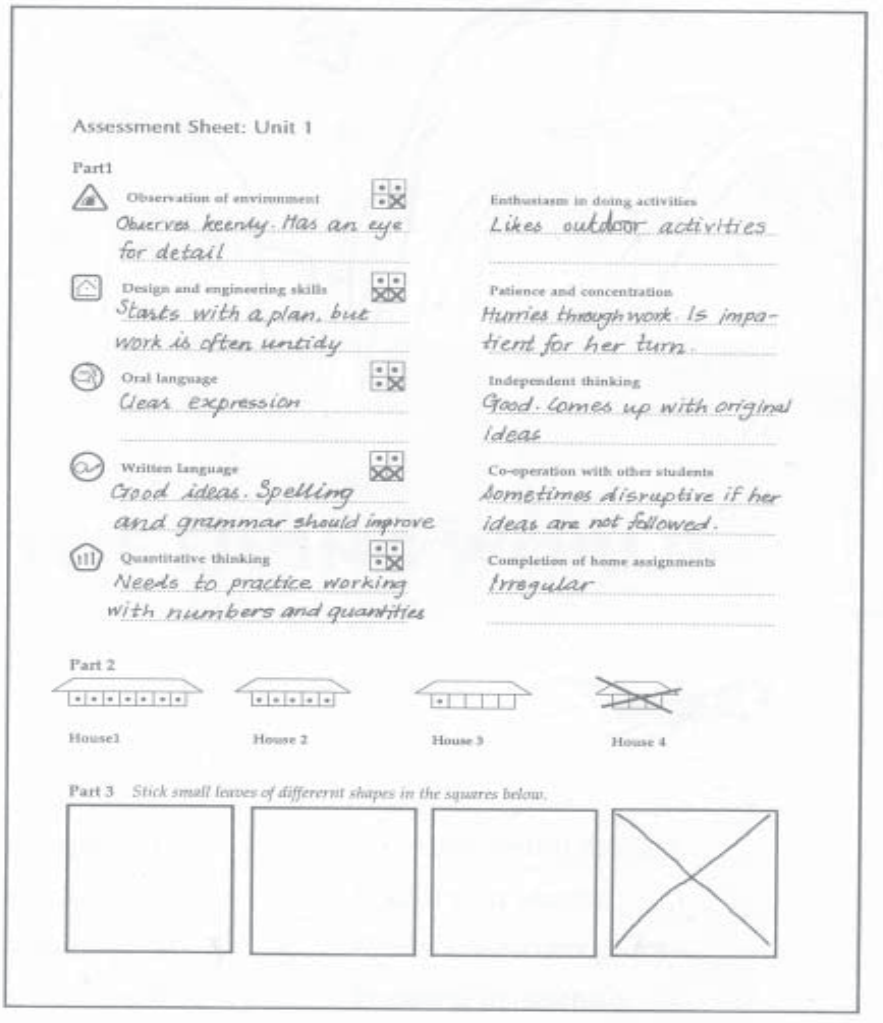
8. Independent thinking and **9. Co-operation with other students**

We want to develop in students the ability to come up with original ideas, while at the same time being able to consider the ideas of other students and to work in a group.

10. Completion of home assignments

Some of the activities have to be done at home or information has to be found out from home. A few exercises may also be given as home assignments.

A filled sample of the assessment sheet



Assessment Sheet: Unit 1

Part1

Observation of environment
Observes keenly. Has an eye for detail

Design and engineering skills
Starts with a plan, but work is often untidy

Oral language
Clear expression

Written language
Good ideas. Spelling and grammar should improve

Quantitative thinking
Needs to practice working with numbers and quantities

Enthusiasm in doing activities
Likes outdoor activities

Patience and concentration
Hurries through work. Is impatient for her turn.

Independent thinking
Good. Comes up with original ideas

Co-operation with other students
Sometimes disruptive if her ideas are not followed.

Completion of home assignments
Irregular

Part 2

House1 House 2 House 3 House 4

Part 3 *Stick small leaves of different shapes in the squares below.*

UNIT 1

THE LIVING WORLD

Main Index

UNIT 1 The living world

AN OVERVIEW

Objective

To introduce students to the richness and variety of the living world:

1.1 Observe the variety of living things in their *immediate surroundings*.
1.2 Identify common plants and animals around them. (Common or local names of at least 10 plants and 10 animals for students in urban areas. In rural and especially tribal areas, we could expect students to know many more names of plants and animals.)
1.3 Observe that after the rains, many new plants and animals are seen.
1.4 Observe and draw the gross features of different plants and animals (Details of structure are not expected).
1.5 Observe tree-trunks, barks, leaves, flowers.
1.6 Identify common grains and seeds (At least 10).
1.7 Let seeds sprout to make plants.
1.8 Observe behaviours of common small and large animals (Common insects, birds & larger animals).

What is new in this Unit

The study of living things in primary school frequently starts with the distinction between living and non-living things. For these young students, such a formal approach is quite inappropriate. Students already know, by commonsense, that some things are living while others are non-living. Rather than giving them a formal definition, or providing readymade criteria for distinguishing between living and non-living things, we should encourage students to develop their own intuitive judgements of life. In this Unit therefore, we do not teach about differences between living and non-living. Rather, we help students observe the richness and variety of living things around them.

Main Index

Ideally, this would be the first Unit to be taught, at the start of the school year in June. In most parts of the country, it would be the end of summer. We could observe and count the variety of living things before the summer monsoon breaks, and compare it to the variety seen after the rains have set in (Activity 3 in Chapter 1). The exact timings would differ according to the regions. For example, in the high mountainous regions of the North, this activity might be more appropriate to do at the end of the winter season. In general, the results of the activities in this Unit could vary, depending on the locality.

The emphasis in this Unit is on overall observations of the environment. We do not go into analysis of parts, for example, parts of plants or animals. This we will deal with in later classes.

Study of animal behaviours is an interesting activity which we start in Std.III. This activity will not only help in learning about the environment, it will also develop students' patience and concentration.

Time-table

P: Number of periods

Chapter 1		**Chapter 2**	
P1	- Story	P13-P17	- Activities
P2-P6	- Activities, Summary	P18	- Summary
P7-P12	- Exercises	P19-P23	- Exercises

Chapter 3		**Chapter 4**	
P24	- Story, Intro to Activity 1	P31-P33	- Story, Activities
P25	- Activities	P34-P35	- Terrarium (optional)
P26-P30	- Summary, Exercises	P36-P42	- Summary, Exercises

Some of the activities can be done during a field trip.
Some exercises have to be done as home-work.

CHAPTER 1 So many living things!

STORY

Pea Tale

Mini and Apu were shelling peas with Dada (and eating some too)! Mini was about to pop a pea into her mouth, when Apu cried, "Wait!"

A little green caterpillar lay curled around the pea.

"Is it alive?" Mini touched it with her finger.

The caterpillar moved, but held on to the pea.

"I'll put it back in the pod. Later we can leave it out in the garden."

"Do you know", said Dada, "in a few weeks this little green caterpillar will fly away - it will be a little brown moth then!" Apu and Mini looked in wonder at the caterpillar.

"Or a bird might find it first, and eat it up!" said Mini. Apu made a face at her.

"One day you too can watch a caterpillar turn into a moth or a butterfly", said Dada, "after you find out some more about living things, and how to take care of them."

"Let's start right away", cried Apu. "how many living things can we see in this garden, Mini?"

Hush, hush, don't make a sound,
Walk softly, searching on the ground,

Under stones they creep and hide,
In puddles, ponds, they swim and dive.

Some stand still, with roots so deep,
Home to others, that crawl or sleep,

On branches, barks and leaves they stay,
Or spread their wings, and fly away!

Main Index

ACTIVITIES

Search for living things

1. In the classroom

Make a list of all the living things in your classroom. You, your classmates and your teacher are living. What are the other living things in the classroom?

2. Outside the classroom

Now list the living things that you see in your school grounds, or near your house.

Look for different kinds of plants and trees. Look closely on the ground, under stones, inside puddles or ponds, in bushes, on branches, leaves and barks of trees, in the air, and in the sky. See who can notice and write down the largest number of living things.
(Ask your teacher the spellings of names you don't know.)

Take Care !

Do not go too deep into grass or bushes. Do not put your hand into cracks, or turn over large stones. You may get a nasty surprise!

3. Summer and rains

Choose a small patch of land near your home or school. Count how many different plants you see there during the summer season. How many of these plants are trees?

Look again after the rainy season has started. The old plants now look greener. But you also see many more, and many different kinds of small, baby plants. As the days go by, they grow bigger.

You also see new animals. Look for frogs, earthworms, and different kinds of insects, like caterpillars, butterflies, beetles and flies.

Count how many different kinds of plants and animals you see in the rainy season.

Think! Think!
Where did all these new plants and animals come from?
Where were they hiding in the summer?

SUMMARY

Remember this

We see many different kinds of living things around us. All these living things are either plants or animals.

Plants stay fixed on the ground; animals move around.

When it rains, we see new plants, and new animals.

Know these words

living thing, plant, grass, bush, tree, animal, insect, caterpillar, beetle
summer, rainy season
sprouts, moves, flies, burrows, climbs, grows

DID YOU KNOW?

• There are so many different kinds of living things on the earth that people have still not finished counting all of them! Of all the different kinds of living things we see, the maximum number is of insects.

• Some living things are so small that we cannot see them! There arecountless numbers of them all around us: in the air, in the soil, in the water, and even inside us!
A microscope makes things look much larger than they are. If you look into a drop of pond water through a microscope, you might see a very tiny animal (Amoeba) or a very tiny plant (Nostoc).

teaching ideas

STORY *(1 period)*

I read out 'Pea-Tale' in the class and explained the unfamiliar words. Most of the students did not know that a caterpillar would turn into a moth or a butterfly. In fact, some of them did not even know the difference between a caterpillar, millipede and an earthworm. But there is time enough for them to find that out.

The story did arouse their curiosity. One student asked me, do caterpillars bite? I told her, they don't bite us, but they can chew up a lot of leaves with their jaws. Some of the hairy caterpillars make you feel itchy too, don't they?

I read out the poem. The students knew it was about searching for living things in the garden, and they liked its sound, but they did not understand all the words. When I asked them where they would search for living things, they gave me responses from the poem, as well as others, like, "in the mud" and "in the sky".

Explanation of poem

Hush, hush, don't make a sound,
Walk softly, searching on the ground,
To watch living things in their natural condition, as much as possible not disturbing their normal activities. Conveys a respect for living things and discourages harming them.

Under stones they creep and hide,
In puddles, ponds, they swim and dive.
Many interesting small animals live under stones. Under large stones there may be dangerous animals like snakes and scorpions, so it is best not to move them. Other stones too should be replaced after observation. In ponds there could be a large variety of plant and animal life, but even in small puddles one might see moss, and small insects like larvae and pupae of mosquitoes.

Main Index

Some stand still, with roots so deep,
Trees and bushes !

Home to others, that crawl or sleep,
Plants are homes to many kinds of insects and spiders. Other plants like moss, lichens and creepers also grow on trees. Pupae of insects 'sleep' for long times on leaves and branches.

On branches, barks and leaves they stay,
Or spread their wings, and fly away!
Birds, bees, butterflies, moths and many others!

New words in the story

pod, shelling, caterpillar, moth, creep, crawl, bark (of tree)

The caterpillar found in the pea-pod is the larva of a pea-moth. (scientific name- *Heliothis armigera* (old name) or *Helicoverpa armigera* (new name)). This caterpillar feeds not just on peas, but on many other pulse crops like, gram or chick-peas (chana), pigeon-peas (toor) groundnut and beans. It also attacks cotton, sunflower, maize, jowar, tomatoes, bhindi and citrus fruits. It is a very destructive pest and a serious problem for farmers. Some years ago, this pest caused large-scale damage to the cotton crop in Guntur district of Andhra Pradesh.

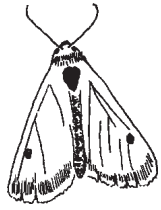
The moth lays its eggs on the tender shoots of the plant. When the tiny caterpillar hatches out, it burrows into the pod or fruit. After destroying several fruits, it burrows into the ground where it forms a cocoon. Usually within a week or two, the moth emerges from the cocoon.

Students might have seen different kinds of insect larvae in other vegetables and in stored grains. Some of them are caterpillars which later turn into moths. Others are worm-like grubs which turn into small beetles or weevils.

Moths and butterflies are very similar insects. Butterflies are usually active during the day, while moths are usually active after sunset. It is easy to distin guish between them from the way they sit - butterflies usually rest with their wings held vertically above their back, while moths keep their wings flat on their back. The tips of the butterflies' antennae (feelers) are rounded, while moths have hairy antennae.

The pea caterpillar

The pupa



The moth

ACTIVITIES

What is a plant? What is an animal?

While doing the activities of looking for living things, I tried to use the words 'animal' and 'plant' in a way different from everyday language. I explained to students that insects, worms, other small animals, birds and fishes are also 'animals'. This is important because in everyday language we use the term 'animals' to mean loosely mammals, reptiles and sometimes amphibians. I did not use these terms, but called them 'four-legged animals'. (Note: Snakes are reptiles but they do not have legs.)

Similarly, I used 'plants', to refer to trees, bushes, grass, herbs, creepers and moss. The last three words were not known to the students, but I used them casually while we were observing those plants, just to make them sound familiar.

> All the living things we can see are either plants or animals. There are innumerable living things all around us that we cannot see with our naked eyes - some of these, like bacteria and viruses, are neither animals nor plants. We will not worry about these for the moment.

How I prepared myself

I found out the common names for different plants and animals. I already knew the names of several trees and garden plants, but I checked up with my colleagues and a gardener on names of others. I also found out the names of some common birds and insects that we see around, but are not careful about naming. For example, I found out that the large birds I used to call eagles were actually kites. At the end of it, I am sure I knew many more than ten different kinds of plants, and ten different kinds of animals.

What I wanted to achieve through the activities

Our Big List (OBL) of living things: At the end of Activities 1-3, I wanted the class to collect a long list of plants and animals in the surroundings. Even if they did not have a name for a plant or animal, it could still be given an informal name (for example, "striped grass"), and counted in the list. In this way, I could relate the study of living things to the environment of the students. I planned to use the OBL (these examples of living things) in subsequent teaching, exercises and evaluation.

What students observe in the activities

During our research and field work at the HBCSE, we have found that students spontaneously observe a *large* number of living things in their surroundings. Primary school students in rural areas are able to name more than a hundred different kinds of living things, including trees, plants, birds, insects, and other small animals that are commonly seen around us. In the centre of large cities, the choice may be less, but young children in their play do notice many small animals, eg. insects, and different kind of birds. Make sure that the students' list comes close to exhausting the possiblities.

Children are usually more observant than adults. Children from less privileged homes, without many entertainment opportunities like TV etc., find out a lot more about the natural

world. You may not know the names of all the plants and animals that the students observe. They may have their own names for these. In that case, accept their colloquial names and introduce standard names if they do exist. Common names of some trees and garden plants are given in the glossary. If you do not find common names for some plants or animals, a short description will also do - for example, "bush with small purple flowers". There is no need to look for exact scientific terminology.

Notice that most living things have some favourite place to stay. On bushes you might find caterpillars and other small insects. On the barks of trees you might see ants and beetles. A favourite place for insects and earthworms is the soil underneath stones. On damp walls you might find moss. On branches of trees and in the air you would find birds.

Hints for doing the activities

1. In the classroom (*1 period*)

I asked the students to look carefully around the classroom for living things. At first they gave very quick answers and said, "all of us are living things!" But when I asked, are there any others, they were puzzled. I asked them to look in corners, on the walls and ceiling. Then they saw ants, flies and spiders-webs. One of them noticed a potted plant. One girl pointed to another and said, "Teacher, Geeta has lice in her hair!" (Here I stopped and gave them a lecture on keeping their hair clean! I think the girl felt bad, but I am sure she will get rid of the lice now.)

I told the students that over the next few days, they were going to watch for living things, and they were to make in their notebook a *Big List* of plants and animals around them. They were only allowed to write the names of those plants and animals that they had actually seen, and not ones they had only heard of, or seen pictures of.

At the end of the period, I told them that next time we would be looking for living things in the school grounds. They would have to look closely, but to make sure they did not touch any animals or plants. They must not break off leaves or flowers, nor disturb the animals.

2. Outside the classroom (*Double period*)

We are lucky to have a good school ground with plenty of plants. Where there are plants,

there have to be animals! The students found guava, coconut, tamarind, neem and champa trees, different kinds of grass and weeds, tulsi, lantana (ghaneri/tantani) and bougainvilla bushes. They also saw sparrows, crows, a squirrel, a cat, a caterpillar on a bush, and many kinds of ants in the grass and on tree trunks. They were curious about a mound of mud and dried leaves on one of the branches of the tamarind tree. I guessed it might be the nest of a some bird or insects, and asked them to keep a watch on it every day, but not to disturb it. A few days later however, the mound disappeared without trace.

Students were very excited about writing down the names of whatever plants and animals they found. I had to tell them several spellings, including 'bougainvilla', 'sparrow', 'caterpillar',... The exercise of asking questions was done during this activity. Starting from students' questions about the nest, I told them to ask questions about the things that they saw. Some of their questions are given in the exercise section.

If the school compound does not have many plants, you could take students to some nearby garden, or on a field trip to a place with more plants for better observations. The activities of Chapter 2 including leaf collection, and those of Chapter 4 can be done during a field trip. See page 6 for general instructions on field trips. It would help to make a previous visit to the place, identify several plants and animals in that area, and look for suitable trees to do the tree-holding and other activities.

Please keep a look out for any out-of-use nests of birds. After observation, they can be saved for Activity 1 of Chapter 11.

3. Summer and rains *(2 periods)*

For this activity, we need a minimum of a few square metres of ground. We selected a convenient portion of the school ground adjoining a nullah. You might find it useful to have some landmarks, or mark the boundaries of an area in other ways, using sticks, stones or strings tied between posts, though it is often difficult to ensure that the markings remain undisturbed.

The list of living things made by the class before the rains more than doubled after about a week of rains. All the old plants were there, but there was much more grass, and also more different kinds of grasses and weeds. Under the tamarind tree, there were small saplings of

tamarind. A few students at once guessed that the seeds, inside the tamarind pods which had fallen from the tree, must have sprouted.

There were tiny fish and other animals in the nullah. Under stones there were now many more insects and earthworms.

We later discussed what we had observed. I remembered something interesting. I have some potted plants at home. In one of the pots, I have not planted anything, but I water it along with the others. Now, quite a few small plants and some grass has grown in it. I have noticed that if there is cowdung manure in the pots, much more grass comes up in it. How do all these plants come up? Are the seeds already there in the mud? Perhaps there are seeds in the cowdung too. The children were quite interested when I told them all this.

How many plants and animals did you find?

I collected the students' findings into a list on the blackboard. From the list, they counted the number of different plants and animals that they saw before and during the rains.

The list is shown on the next page. The animals that have disappeared after the rains are marked with a □ and the new plants and animals found after the rains are marked with a • .

Plants seen before the rains

guava tree
tamarind tree
coconut tree
lantana bush (tantani)
bush with white flowers
bush with thorns
durva grass
grass with wide leaves

Total = 8 kinds of plants

Animals seen before the rains

□ dog
crow
□ maynah
sparrow
garden lizard
□ spider
cockroach
fly
small ants (red and black)
big ants
caterpillar
□ cotton tunnel worm

Total= 13 kinds of animals

Plants seen during the rains

guava tree
tamarind tree (with saplings near it)
coconut tree
lantana bush (tantani)
bush with white flowers
bush with thorns
- 4 different kinds of grass
- 14 different kinds of weeds
- moss

Total = 25 kinds of plants

Animals seen during the rains

crow
- sparrow
- parakeets (flying)
- cattle egret (flying)

garden lizard
- cockroach (4 kinds)

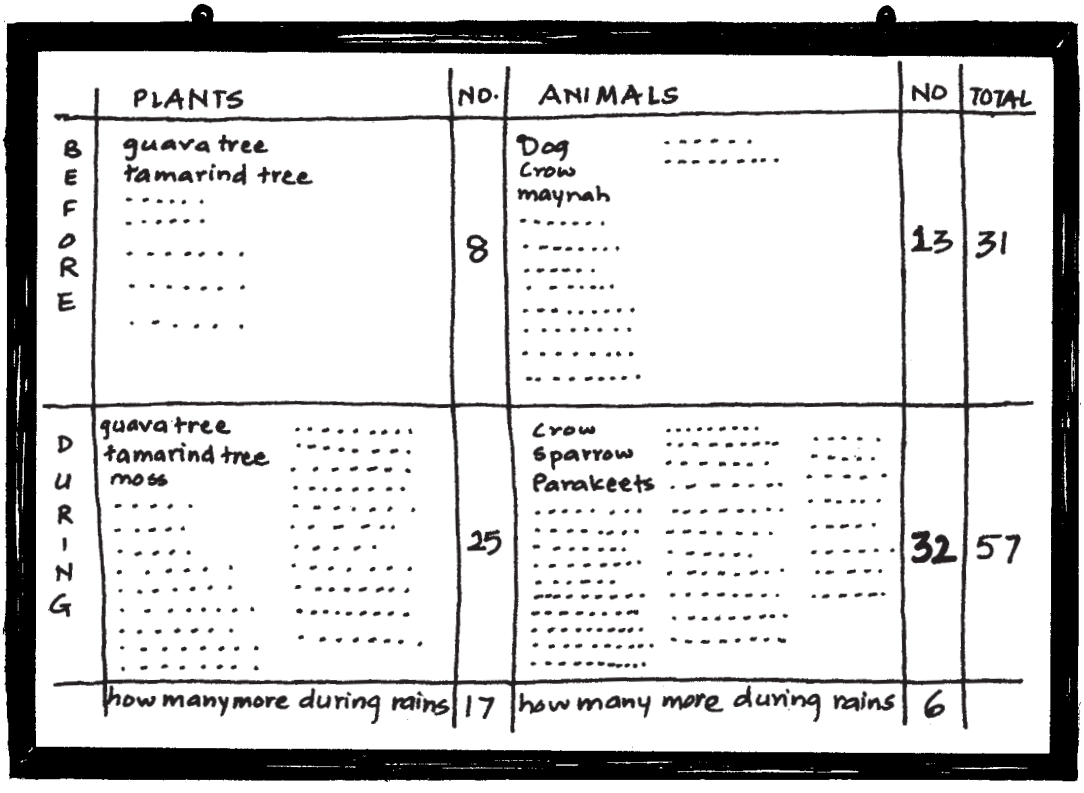
fly
- bedbug
- yellow butterflies
- bumble bee
- centipede (2 kinds)
- small ants (4 kinds)

big ants
- white grub
- earthworm (2 kinds)
- mosquitoes

caterpillar
- frog
- crab
- shinghada fish
- small grubs in the water
- small red insects (2 kinds)
- lady bird beetle

Total= 32 kinds of animals

BLACKBOARD WORK



	PLANTS	NO.	ANIMALS	NO	TOTAL
BEFORE	guava tree tamarind tree	8	Dog Crow maynah	13	31
DURING	guava tree tamarind tree moss	25	Crow Sparrow Parakeets	32	57
	how many more during rains	17	how many more during rains	6	

Circle the plants and animals which appeared after the rains.

Underline the plants and animals which disappeared after the rains.

Students underlined in their Workbook the new plants and animals seen after the rains. The new plants were easy to explain. Students said that the seeds must have dropped into the soil from the grass and from other plants which had grown there in the previous year. Some seeds might have been blown there by the wind, or been brought by animals.

The new animals were more difficult to explain. Students guessed that eggs of earthworms might have hatched. Many insects too breed in the rainy season. Mosquitoes lay eggs in puddles where one can see their larvas and pupas. Houseflies are heavy with eggs in the rainy season. Some animals, like snakes and rats, are driven out of their homes which get filled with rain water. The large number of plants provide food for all the new animals.

We did some simple quick arithmetic, like:
Number of kinds of living things = Number of kinds of plants + Number of kinds of animals

Since all the old plants were still there after the rains, students could see that:
Number of *new* kinds of plants after the rains = Number of kinds of plants after the rains - Number of kinds of plants before the rains

Although some of the old animals could not be located after the rains, the total number of kinds of animals was clearly larger. Students also checked how many animals were seen only in the earlier count and how many were common to both counts. (Please take a minute to see why the simple subtraction calculation done for kinds of plants does not hold for kinds of animals.)

EXERCISES *(6 periods +home-work)*

The exercises are based on the activities already done. Our Big List of living things (OBL), which we made in the field trip and while doing the activities, was pinned up on the wall. We used it in doing these exercises.

Observation-based exercises

Name and draw

1. A plant that:

a. Climbs on other trees

b. Grows in water

2. An animal that:

a. Moves on the ground

b. Flies in the air

c. Lives under the ground

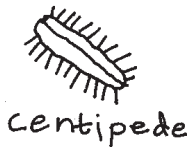
d. Hides under stones

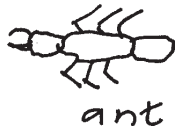
e. Climbs on trees and bushes

f. Lives in water

I asked students to select living things from the OBL. They made the drawings on their own. I went around the class and pointed out to them a few things, like shapes of leaves.

Sample drawings by students:





Short questions

(Some sample answers are given. Students may think of others. Please use common or local names.)

1. Give examples of these living things:

a. These living things always stay fixed on the ground.
Plants -although there are many plants that float in water. You may have seen long floating strands of spirogyra, or water hyacinth which is a plant that floats on water. The money plant does not need soil to grow.

b. These animals have no legs.
snakes, earthworms, snails, fish ...

c. We have two legs. Which other animals have two legs?
birds

d. These animals have four legs.
dog, cat, rat ...,
lizards, chameleons, turtles, crocodiles ...,
frogs, salamanders ...

e. These animals have six legs.
Insects like grasshoppers, ants, cockroaches ... Some of these have long antennae (feelers) which students sometimes mistake for legs.

f. These animals have eight legs.
spiders

g. These animals have so many legs, they are difficult to count.
centipedes, millipedes (shatpaad, kankhajura, kansala .. in Hindi)

h. These animals have hair on their body.
dogs, cats, cows, goat, sheep .. (all mammals). Some insects, like caterpillars and moths, have hair-like things on their body.

i. These animals stay on the undersides of leaves.
spiders, caterpillars, many kinds of insects and their eggs

j. You see these animals in the rainy season.
frogs, tadpoles, earthworms, snails, many kinds of insects, flies and mosquitoes. The black-and-white cuckoo (Papiya or Chatak in Hindi) migrates with the monsoon. Flocks of small munia birds are seen in the rainy season.

2. Why do walls and rocks look green in the rainy season?
They are covered by a number of many tiny plants called moss.

What's same? What's different?

1. Give two similarities and two differences between:

a. A mango tree and a peepal tree
Both are large trees, though the Peepal grows to a bigger size. Their leaves are of different shapes. Fruits of the Peepal are much smaller than Mangoes.

b. A caterpillar and an earthworm
Both are long wiggly creatures, both have a segmented body. A caterpillar has legs and hair on its body, an earthworm does not. Earthworms burrow under the ground, most caterpillars do not. Earthworms eat soil, caterpillars eat leaves.

2. Find the odd one out:

a. coconut, *frog*, chikoo, mango (Not a fruit)
b. mosquito, butterfly, *crow*, bee (It is a bird)
c. frog, *cat*, fish, crocodile (Does not live in water)

Language development exercises

Talk and write

1. Remember and say any poems that you have learnt about any living thing (plant or animal).
I had asked the students to think of poems at home. They came prepared with many

poems,about animals like cock, parakeet, koel, butterfly, monkey, cow. The only plant figuring in a poem was the mango. In Indian languages however, many poems about trees exist, showing their importance in our culture, which is lost in urbanisation and English-medium education!

Some of the poems actually conveyed wrong ideas. For example, the koel in some songs was thought to be a female. I told the students that it is the male koel which is black, and which sings. The female is speckled brown and white and it makes only short, sharp sounds.

2. **Write five sentences about the plants in your school ground.**

3. **Write five sentences about the animals in your school ground.**

I gave the students some hints like:
Write the name of the plants. Which of them are trees? Which give shade? Which have flowers? Which ones do you like best? Why? etc.

Write the names of the animals. Which are the smallest and largest of them? Where are they usually seen? What sounds do they make? Have you seen them eating? Which ones bite? etc. Since this was their first writing exercise of the year, they were not very confident to start with. They did not know exactly what was expected. In writing their own observations, they got stuck on many spellings and constructions. I wrote on the blackboard the difficult words that they asked for. I also helped them with unfamiliar sentence constructions.

Play with words

1. **Make sentences with:**

grass, tree, fruit, caterpillar, bulbul
flies, burrows, grows

Cows eat grass.
I climbed the tree.
This fruit has many seeds.
The caterpillar is black and orange.

A rat burrows in the ground.
Hair grows on my head.

2. Now make some more sentences with the words given above. Each sentence should use two or more of these words.

The grass grows under the tree;
The caterpillar burrows into the fruit.
The caterpillar grows very fat.
The coconut tree grows tall.
The fruit grows on the tree.
The bulbul eats the caterpillar.

Ask a question

1. Ask questions about the plants and animals you saw while doing the activities. Think of how you will try to find the answers.

Sample questions asked by students:

1. *How do spiders spin their webs?*
   Siders spin and repair their webs almost daily. You can keep a watch on a web at some place you pass often. It is easy to see how they do it. You find a thread coming out of their body. It is a strong and sticky thread. What it is made of, is something people are still trying to find out about.
2. *Why does the bottle palm have such a thick stem?*
   I asked the students to observe stems of other trees. Large trees have thick stems to hold them up. Vines have thin stems, but they climb on a support. A large tree with a thin stem would fall and die.

3. *Why does the mango tree have long leaves?*
   I asked them to look at leaves of other plants. Most are long or have pointed ends. How would pointed leaves help the tree? They let the rain water drain off.

4. *Why do pineapples have spines on them?*
   Pineapples grow close to the ground. The spines protect them from being eaten by animals.

These answers were perhaps not very satisfactory, as one can always find exceptions to any rule. For example, there are many fruits which grow close to the ground but do not have spines. Encourage students to look fpr such examples. The aim of these explanations is for students to start thinking of characteristics of living things in terms of: "How does this help the plant or animal to survive in its environment? To find food? To escape from its enemies?". Such a way of thinking will help them to understand the idea of adaptations that is introduced in later classes.

CHAPTER 2 # Looking at plants

ACTIVITIES

Our green friends

1. The plants you know

Write down the names of all the different kinds of plants that you know. Which of these are small plants, and which are tall trees?

2. Looking at leaves

Collect the leaves of different kinds of trees. For example, you may collect:

Ber Mango Ashoka Banyan Peepal

a. Arrange the leaves from shortest to longest.

b. Draw the shape of each leaf.

c. Are all the leaves of the same colour? Arrange the green leaves from darkest to lightest.

d. Feel each leaf. Some leaves are thin, some are thick. Some leaves are smooth, some are rough.

e. Crush a part of each leaf and smell it. Each leaf has its own kind of smell.

3. Guess the leaf!

Close your eyes. Now ask your friend to hand you one leaf at a time. Touch the upper and lower surfaces of the leaf, feel its edges, smell it, but do not open your eyes to look! How many leaves can you recognise in this way?

4. Flowers

a. Look for the flowers of different plants around you.

Main Index

b. Play a game: A friend shows you any flower. You guess which plant it comes from.

c. Find plants which never get any flowers.

5. How many children to hold one tree?

a. Put your arms around the trunk of a tree. Can you reach all the way around? Now try this with you and a friend both stretching out your arms. How many of you does it take to hold one tree?

b. Find out the tree with the largest trunk in your village or around where you live.

6. Rough and smooth barks

Feel the barks of trees. Are there any animals or plants that you see on the barks?

Hold a piece of paper against a bark of a tree. Shade above it with a crayon or pencil. (Try to use a crayon of the same colour as the bark).

Paste this paper in your WorkBook. Write the name of the tree below it.

Think! Think!

What would happen if there were no plants?

No trees to give us shade; no grass to sit on; no grains, fruits or vegetables to eat! Could we remain alive in such a place?

SUMMARY

Remember this

Plants give us food to eat. They keep our surroundings cool and shady. They make the air fresh for us to breathe.

Flowers and fruits

Most plants bear flowers. Flowers turn into fruits. Fruits have seeds in them.

Leaves

Every kind of plant has its own kind of leaf. Leaves have different shapes, sizes, colours, feels and smells.

Plant Stems

Small plants have thin stems. Trees have thick trunks and branches. As trees grow older, their trunks grow wider. Trunks of some trees grow very wide.

Tree barks

Some barks are smooth, others are rough. Some barks are almost white, others are dark brown. Barks are homes for many insects. Barks protect the tree.

How plants stand up

Plants stand firmly on the ground. It takes a very very strong wind to knock down a big tree.

Plants have roots which go into the soil. Roots of big trees spread wide and go deep down into the soil. Roots fix the plant in the ground.

What else do roots do?

Roots also suck up water and different kinds of salts from the soil. They send the water and salts up to the rest of the plant.

Know these words

root, stem, trunk, bark, branch, leaf
large, small, thick, thin, smooth, rough

DID YOU KNOW

- Plants need air, just like we do. They breathe through their leaves, stems and roots.

teaching ideas

ACTIVITIES

1. The plants you know *(1 period)*

I had found out before-hand the names of some common trees and small plants. The class came up with about fifty plants that they had seen. I listed these on the board as small plants and tall trees.

2. Looking at leaves *(A double period for activities 2-4)*

I asked each student to get one leaf of three different kinds of plants. They first described the shapes, using words like round, long, pointed, jagged (serrated) etc. They also used their own descriptions, for example, "it is like cardboard" for the champa leaf. I introduced the words dark, light, thick, thin, smooth, rough, etc.

Students noticed that the young leaves on some trees were reddish brown. The older ones, many of which they had picked up from under the tree, were yellow. They found that some leaves when crushed have very characteristic smells. Many are pleasant like, mango, lime, tamarind, tulsi and eucalyptus.

Then they did the activity in groups of five. There was enough variety for each student to contribute one leaf to the group.

3. Guess the leaf!

This is an enjoyable game which can also be played in a free period, during outings/ picnics etc.

4. Flowers

A few plants, like ferns, pines and crotons, do not have flowers. Large flowers are easy to

Main Index

notice. I asked students to also notice small flowers, like those of grass. They observed that some flowers grow singly while others grow in bunches.

The summary page *Remember this* mentions the fact that flowers turn into fruits which contain seeds. The gulmohar tree is illustrated on this page with flowers and pods. I asked students to point out the fruits on this tree, and explained that beans and pods are also fruits.

5. How many children to hold one tree? *(A double period for activities 5-6 , Outdoors)*

I had to tell the students the meaning of "trunk" of a tree. Then we played a game in which I pretended to be a wood-cutter. I would say "Now I am going to cut down the ___ tree". The students had to run to the tree, surround it, and say, "O woodcutter, please don't cut down this tree." Then I asked, "Why should I not cut it?" The students replied, "It gives us fruits and shade .. etc.". Then the students had to say, for each tree, how many of them were needed to hold it - to show how wide the trunk was. I told them that only very old trees have very wide trunks. Students told me that the Peepal tree next to the nearby temple had the largest trunk that they had seen.

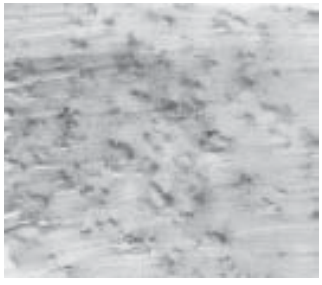
6. Rough and smooth barks

I asked students to look at the barks of trees. They described their observations in their own words, using colour names (eg. light, dark, brown, white), texture (rough, smooth, or different patterns),

Barks are very important for trees. If too much of the bark is removed, the tree would die. Common animals seen on barks are ants and beetles. Plants like moss, lichen and mushrooms are also seen on barks.

Bark rubbing: This was a simple activity. I divided the students into groups who went in turn to five trees. They used the pages of their notebooks to record the bark texture (only one side could be used) and wrote the name of the tree below it.

Sample bark rubbings:



Bhendi

Bamboo

Royal Palm

EXERCISES *(5 periods + home-work)*

Observation-based exercises

Short questions

(Some sample answers are given. Plants will be different depending on the environment. Local names should be used.)

1. Write the names below from smallest to largest plant.

papaya, moss, banyan, rose, mango

moss, rose, papaya, mango, banyan

I explained that a full-grown plant is intended here. A sapling of banyan may be smaller than a full-grown rose bush. It is better to do such exercises using examples from the students' surroundings.

2. Name three plants which:

a. Give us tasty fruit
mango, banana, chikoo, guava ...

b. Give us lot of shade
banyan, peepal, seesam, siris ...

c. Have thorns
babool, rose, red silk cotton (Marathi: kate-savari; Hindi: simal), cactus ...

d. Bear red flowers
hibiscus, gulmohur, Indian coral (Hindi. mandara, Marathi: pangara), red silk cotton, tulip tree (Hindi. rugtoora) ...

e. Bear yellow flowers
laburnum, copper-pod, bhendi, champa ...

f. Bear white flowers
champa, rajnigandha, morga, jasmine, Indian cork ...

Language development exercises

Look, tell and write

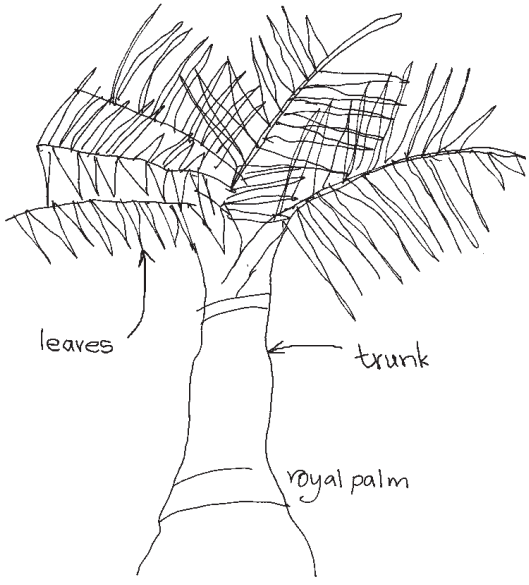
1. Tell your friend about a tree that you have seen. Your friend will ask you some easy questions about that tree. Answer the questions. Write down the questions and the answers about that tree.

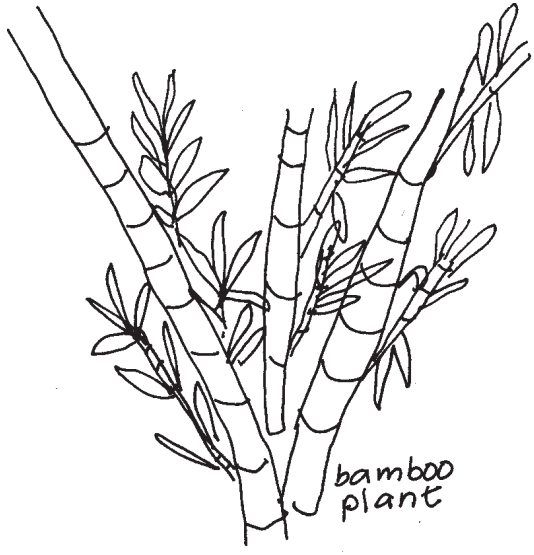
In this exercise, I had to remind students to ask simple questions, like, "Where have you seen this tree?" "Is it tall or short?" "Does it have flowers?" etc. Sometimes they asked difficult questions like, "Why are the leaves green?" I told them they should ask questions about their friend's tree that they could answer about their own tree. After some practice they got this idea.

2. **Describe one plant near your home or school. Draw its picture. Label its parts. Write five sentences about the plant.**

   After all the activities so far, students were familiar with the plants and trees in the school ground. I assigned one plant to a group of five students, asked them to look at it carefully, and then draw. I asked them to notice the overall shape of trees, i.e., trunk thick or thin, long or short, canopy (leafy part) big or small, many or few leaves and their shape, any flowers, fruits, .. etc. An easy plant for students to draw was clover. These are tiny plants with three heart-shaped leaves that grow along with grass.

Student's drawings:





Students came up to the class and described their observations of the plant. Afterwards they wrote about them. Here is a sample of student's writing:

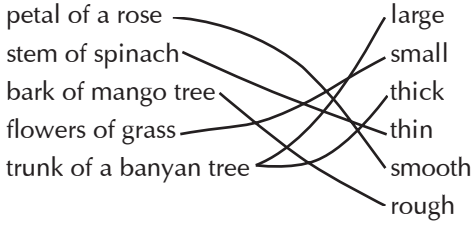
The Bamboo Plant
I like the bamboo plant.
The leaves are sharp.
The bamboo are thin.
The bamboo are yellow and green in colour.
The bamboo look like sugar cane.

3. **Look at the things around you, and guess which ones are made from plants.**
   All wooden things like doors, windows, furniture, pencils ...; erasers ...; cotton clothes, ropes; medicines, the oil in your hair ...

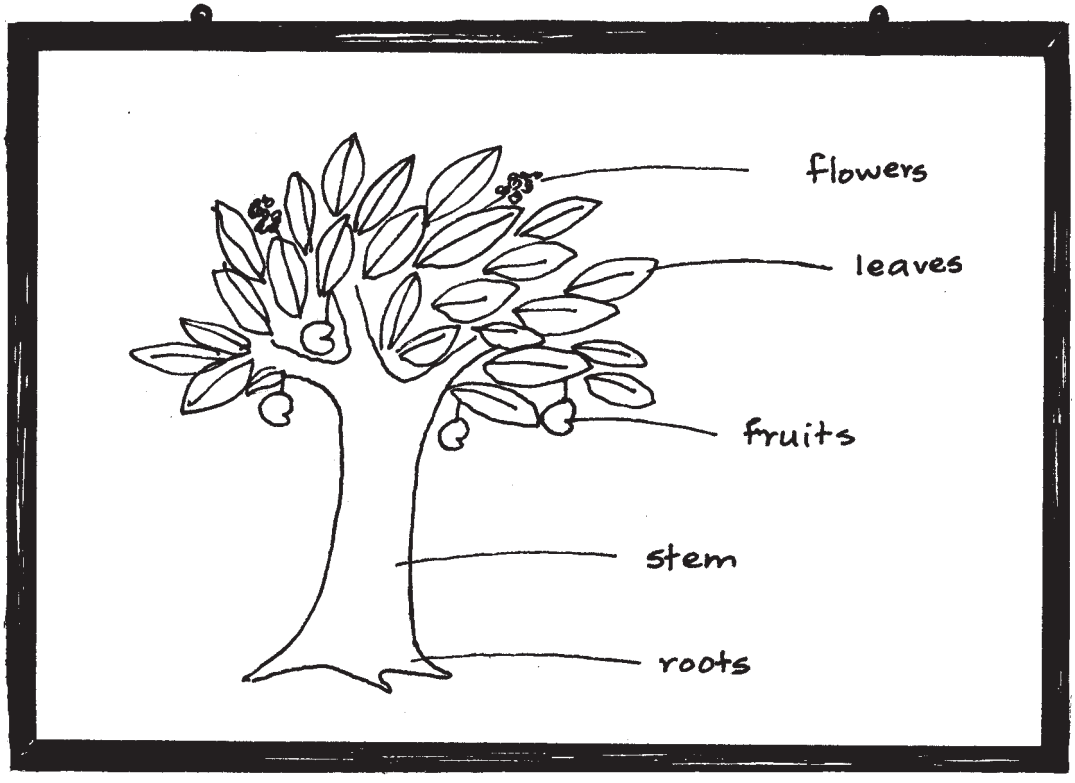
4. **Leaves often change colour as they grow older. Watch the leaves of plants around you. Which plants have new leaves of a different colour from older leaves?**
   Students noticed that new leaves of many plants, for example, those of rose, mango, peepal, etc., were reddish. They also noticed that old leaves of tamarind, almond, etc. are yellow.

Play with words

1. **Match the part of the plant with the word or words that describe it:**



BLACKBOARD WORK



Draw the tree on the board. Call students to the board and ask them to label the parts.

CHAPTER 3 Grow your own Plant

STORY

A secret life

Dada walked into the room with a merry twinkle in his eye. He held out his closed fist. "Guess what I have in here!"

"A caterpillar!" cried Apu.

"Don't be silly", Mini said, "the caterpillar would die if he held it so tight. Oh Dada, give us a clue!"

"Well, it *is* living, like a caterpillar", said Dada ..

It's hard and round, but not a stone.
For in the ground, it grows on its own.
Water with a pail, and it sprouts a tail!
Then shoots up high, for it's alive!

What is it?
"I know!" shouted Mini and Apu together, "it is a ____ "

ACTIVITIES

A plant is born

1. Seeds in your kitchen

Look for different kinds of grains in your kitchen. Learn to recognise:

rice, wheat, ragi, jowar, bajra ...

Main Index

toor, udad, moong, masoor, groundnut ...
mustard, cumin (jeera), methi, coriander (dhania), tamarind ...

2. Plant a seed

With your friends, plant a little of each kind of grain in empty boxes or small pots filled with mud. Water your seeds regularly. Watch the plants grow.

Try planting different dals, grains of rice, sago. Do they sprout? Make your own guess why they did or did not sprout.

3. Watch closely!

Which of the seeds sprouted first? Did you see the tiny root going into the soil? Which plants grew the tallest? Describe the colours and shapes of the leaves of different plants.

Watch your small plant grow bigger. After some time it may need more space to grow. You will have to put it in a bigger pot, or in the ground.

SUMMARY

Remember this

How plants grow

Plants grow from seeds. When the weather is wet and warm, seeds sprout and plants grow well.

Some plants live for less than a year, others live for many years.

Only some plants become trees. Plants take many years to become trees. Some trees around you may be older than your parents or grandparents!

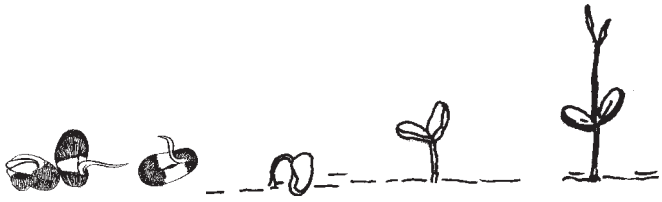
You have seen how many new plants and animals appear in the rainy season. Some of these plants may, after many years, grow into trees.

We grow plants

Different kinds of plants are grown by farmers in fields. Most of our food comes from plants that farmers grow.

DID YOU KNOW?

- Banyan, peepal and tamarind trees live for hundreds of years.
- The largest seed in India is the coconut.
- The caterpillar that Mini and Apu found, also eats toor, peanuts, beans, cotton, sunflower, corn, jowar, tomatoes, oranges ...! Many such caterpillars together can destroy a whole field of crops.



teaching ideas

STORY *(1/2 period)*

The story was fairly easy to understand. A few students guessed the answer to the riddle, but I asked them not to say it aloud at once. I could see their eyes shining with the effort to keep the answer to themselves!

Seeds are living things, in which the life processes are dormant or slowed down. Often students think that seeds are nonliving; they 'get life' from water or soil. They might also believe that eggs are nonliving. This is of course a wrong idea. Life is not some 'thing' that can go in or out of a body.

What *is* life then? That is a difficult question - to answer it one needs to know what a living cell is and what kind of processes go on inside the cell. But even after knowing that, scientists still can not give a really satisfactory answer to this question!

ACTIVITIES

1. Seeds in your kitchen *(1 period for activities 1-2)*

The first part of this activity (looking for seeds in the kitchen) has to be done at home. Students have to learn to recognise
cereals like rice, wheat, ragi, jowar, bajra ...
pulses like toor, masoor, moong, udad, groundnut ...
spices like mustard, jeera, methi, coriander (dhania), tamarind ...

Main Index

For explanation of the terms 'cereals' and 'pulses' please see Chapter 6 (Our Food).

2. Plant a seed

Each student in the class brought one kind of grain and planted it.

> Some of the grains in the kitchen are not complete seeds, so they do not sprout. Dals are only a part of seeds; grains of rice also have had the germinating part removed with the husk. Sago (sabudana) is not a seed at all, but made from the tapioca root.

3. Watch closely! *(Daily)*

This activity was carried out daily. Every morning after attendance, the students looked at their sprouting seed, drew a little picture of it, and wrote one sentence about it. Over the week-end, they took their plant home and did these observations. The drawing, talking and writing exercises were thus all done together.

Students noticed many things about the seedlings while drawing them -for example, the appearance of the radical (I told them it was the root), the change in colour of cotyledons, serrations on leaves and their arrangement, the tendrils of the pea plant, etc. The cereal plants generally did not survive for long. Some plants, like chana, grew quite tall. The potato plant finally grew the tallest.

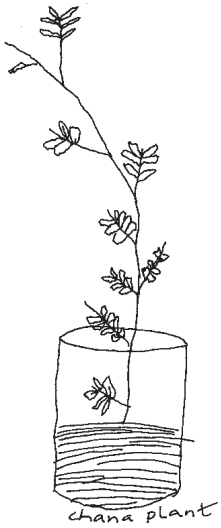
EXERCISES *(5 periods + daily observations)*

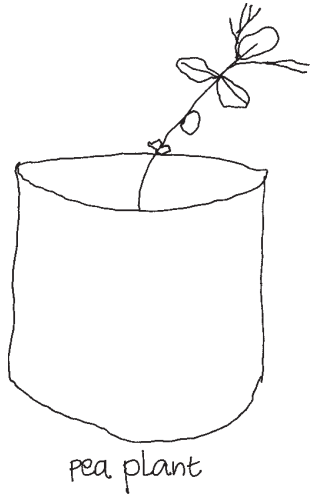
Observation-based exercises

Name and Draw

1. Draw pictures of any five of the plants grown by your class in Activity 2. Below each picture write the name of the seed from which the plant grew.

Sample drawings of seedlings by students:





Short questions

1. **Name ten different kinds of seeds that are sown by farmers (think of all the grains you find in your kitchen).**
   All the cereals and pulses, peas, beans, mustard, coriander, tomato, cotton, etc.
2. **Name some plants that you can grow without a seed.**
   There are many. Common examples are, bulbs like onion, lily, underground stems like potato, ginger, yam, etc and plants gown from cuttings, like, rose, hibiscus, mango, etc.
3. **Name some plants that grow into trees.**
   Mango , banyan, mahua, etc.
4. **Name some plants that do not grow into trees.**
   All cereals and pulses, grasses, bushes like marigold and rose, creepers like pumpkin, etc.

What's same, what's different

1. Give two similarities and two differences between:

a. A grain of jowar and a grain of moong (or any two other grains)
We eat both, both sprout but the plants look different. The colours, shapes and tastes of the grains are different.

b. A rice or wheat plant and a groundnut plant
Both have green leaves but different shapes. Rice or wheat plant looks like grass. Both are grown by farmers.

2. Find the odd one out:

a. peas, mustard, *sago*, wheat. (not a seed)

b. onion, *cabbage*, potato, carrot. (does not sprout)

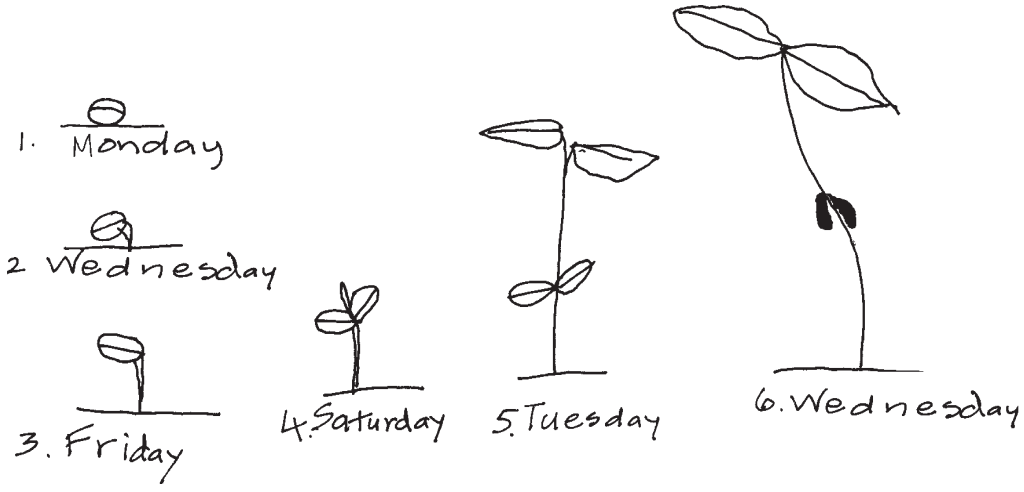
Look, tell and write

Some of the cereals and pulses mentioned in this exercise may not be locally available. They should be substituted by the common cereals and pulses in your area.

1. Plants of rice, wheat, corn, ragi, jowar, and bajra look different from plants of moong, masoor, udad and toovar. Give at least one difference between them.
Rice, wheat, corn, ragi, jowar, and bajra (the cereal plants) are kinds of grasses. These plants therefore look quite different from plants of pulses like moong, masoor, udad and toovar. The pulses have branches and wider leaves. Students should not be told this answer but asked to observe and tell.

2. Watch your little plant as it grows. Every day, draw a picture of the plant and write one or two sentences about how it looks.

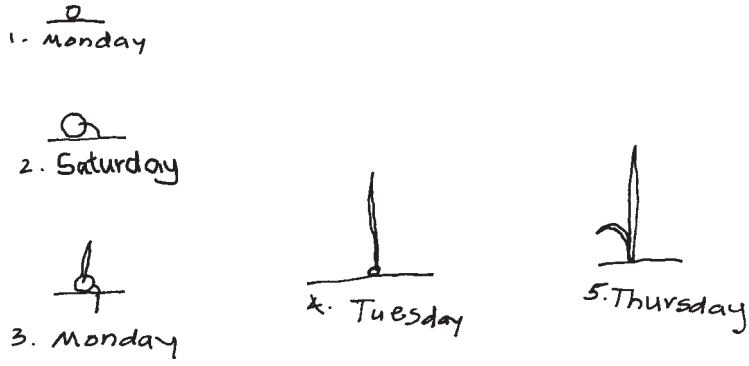
Sample guided writings of students:



On moong seed

The moong seed is small and green with a black mark.

Monday:	*I put the seeds on the mud. I watered them.*
Tuesday:	*The seeds are bigger and soft. The cover is torn.*
Wednesday:	*A root is coming out where there was a black mark.*
Thursday:	*The root is longer. I put one seed in a new pot.*
Friday:	*The root is going in the mud. Small green dots are coming out.*
Saturday:	*The root has picked up the seed. The seed is open and green. Two small leaves are coming from the seed.*
Sunday:	*The plant is taller. The leaves are round.*
Monday:	*The plant is taller.*
Tuesday:	*The leaves are longer.*
Wednesday:	*The plant is taller. The leaves are long and pointed. The seed is dried up.*



On Ragi seed:

The ragi seed is reddish brown and very small.

Monday:	*I planted the seeds. I watered them.*
Tuesday:	*They look the same.*
Wednesday:	*The seeds are bigger and soft.*
Thursday:	*The seeds are bigger.*
Friday:	*It looks the same.*
Saturday:	*A thin root has come for all the seeds.*
Sunday:	*The root is like a hair.*
Monday:	*A thin leaf like grass has come out.*
Tuesday:	*The plant is taller.*
Wednesday:	*The leaves are longer.*
Thursday:	*The leaves are thin and long.*
Friday:	*It looks the same as yesterday.*

Ask a question

1. Ask questions about the growing plant. Think of how you will try to find the answers.

Students' questions:

1. *Why do the two parts of the seed become green?*
   I told students that leaves of a plant make food for it. Before the seedling gets its first leaves, where does it get food from? Some students guessed it must be from the soil. I pointed out that seeds can sprout also in the kitchen, or on a piece of cotton. This is because they get food from the two parts of the seed (cotyledons) which then start to look hollowed out. The plant needs more food as it grows. Then, the cotyledons turn green like leaves, and start to make food for the plant.
2. *Why does the pea plant have curly stems?*
   We put a small dried branch into the soil near the pea plant. The next day, we found that the curly tendrils had wrapped themselves around the branch. Students realised that the pea plant has a thin stem, so needs support. The curly tendrils help it to climb.
3. *How can I make my plant grow faster?*
   Students gave suggestions like, water it more, and put manure. Students realised that too much or too little water would kill the plant. Too much manure also might be bad. The plant would grow well in sunlight rather than in a dark room.

DID YOU KNOW

> The largest seed in the world is the double coconut. It is an endangered species now growing on the Sychelles islands. The fruit weighs 4-6 kg and takes 3-5 years to mature. Many years ago, it was common for these fruits to come floating over the Indian Ocean. The large black *kamundal* (begging bowl) seen in India is really one half of the double coconut shell.

CHAPTER 4 Looking at Animals

STORY

Busy bodies

Apu was munching peanuts and jaggery and reading a book. "Look Apu! You have a line of tiny visitors!"

See them come, in a wiggly line,
Out from a hole, in a wiggly line.
Up the box, back, and down again,
With a load of food much bigger than them.

Some hurry out and some hurry in,
Stop to bump heads, then rush on again.
Oh ants, oh friends, do tell me, be good,
How ever *did you find this store of food?*

ACTIVITIES

Watch and find out!

1. Who got the food

a. Take a piece of something sweet, like sugar or jaggery, or something fried, like chips. Keep this food in an open dish on the floor, and watch.

How long did you have to wait before an insect found the sweet? The first insect to arrive

Main Index

near the sweet was probably an ant.

Watch the ants. Where are they coming from? How do you think they found the food?

Do you think they are eating the food, or are they carrying it away? Where are they taking it?

If you keep grains of sugar, you might see ants carrying them away. What do they do with a peanut or a lump of jaggery, that is too big for them to carry?

b. Drop some pieces of chapati or bread outside the house and keep a watch. Note which birds or four-legged animals come to pick them up. Which animals are the quickest and the boldest in picking up the food that you throw?

2. Flower visitors

Look for flowering plants near your home or school. Watch for flying or crawling insects which visit these plants. Do you see any butterflies?

When you see butterflies, stay still and watch them. Don't catch them! Do they come at all times of the day? Do they sit still or flit from flower to flower? Watch what they do when they sit on a flower.

3. Birds

Which are the most common birds that you see around your house? At what times of the day do you hear the sounds of birds? Listen to the sounds of different birds. Learn to make sounds like these birds. Make a collection of bird feathers. Guess which bird they belong to. Do you see the same birds all through the year? Watch for new kinds of birds that might come in early summer, in the rainy season, and in the winter season.

Which birds are always seen in groups, and which birds are by themselves? Do birds come together in groups at some times of the day? Which times?

Think! Think!

Do birds like to go to some trees more than to others? Why do you think that is so?

SUMMARY

Remember this

Many animals live in and near our homes.

Some animals, like ants, cockroaches, rats, crows and dogs, eat the food that we leave around.

Some animals, like mosquitoes, bedbugs, lice and fleas, drink our blood.

Animals that help us

We keep some animals because they help us. They give us milk, eggs or wool, they guard our houses, or pull carts and ploughs. They are called 'domestic animals'.

Like all animals, domestic animals need food, water, shelter and exercise to stay healthy. We feed and take care of domestic animals. They need us, and we need them.

Other animals too help us in many ways. Frogs and birds eat mosquitoes and other insects. Earthworms loosen the soil and make it good for plants to grow. Snakes eat rats which eat our grain.

Know these words

domestic animals, plough, loosen

DID YOU KNOW?

• An owl can turn its head around in three-fourths of a circle!

• A small insect, called an ant-lion, lives in dry, sandy soil. It makes a cone-shaped pit in the soil. Then it waits for ants or other insects to fall in, so it can catch and eat them. Look around you for these ant-lion pits!

• The woodpecker's tongue is so long, it does not fit into its mouth. The woodpecker keeps it folded at the back of its head.

teaching ideas

STORY (*1/2 period*)

This story and poem is short easy to understand, though it ends with a very difficult question. Some students thought that peanuts were the same as peas. I explained this point in Hindi, saying that peanuts were also called groundnuts.

In the end, I asked them what the poem described. A couple of students realised on their own that it was about ants. The others then immediately caught on. They have often seen ants, so the situation was familiar.

> Ants have many different methods of finding their way to their nest and food. Using these, they learn to find their way around in the area surrounding their nest. An ant which finds food, returns to its nest and excitedly pecks other ants, or strikes them with its feelers, or runs around the nest very fast. Other ants also get excited and start doing their jobs energetically, like repairing their nest, or taking care of the young ones. Some of the excited ants pour out of the nest where they soon find the food.
>
> Some kinds of ants, when they walk away from their nest, leave a trail of a scent, which helps them find their way back again. The ants returning from the food press their abdomen to the ground and leave a special kind of trail which signals that there is food on that route. Ants going one way occasionally stop to touch their antennae with ants going the other way. The two ants also exchange some drops of liquids from mouth to mouth: this is their way of communicating messages about food, or other happenings in the ant colony.

Main Index

ACTIVITIES

1. Who got the food *(2 periods)*

a. In the beginning of the lesson, we kept some jaggery and peanuts on a ledge just outside the classroom. Beyond this ledge is an open area with grass and some bushes, with many garden ants. We did not have to wait long, as some ants were already wandering around. The first ant to find the food touched it for a few seconds and rushed wildly off. Several other ants also found it, and soon many ants were swarming around.

The students noticed that there were four different kinds of ants. I helped them to describe the ants as, "big/ small/ tiny, black/ brown/ red, with white stomach, with big biting jaws etc.". At first, the ants were only going at the jaggery and ignoring the peanuts. But when we crushed some of the peanuts, they started going to those. The students noticed many more things, for example, that some of the ants (the ones which first found the food) were coming from all directions; others were coming in a line; some kinds were stuck to the jaggery and seemed to be eating it; while others were carrying away pieces of it; the ants with big jaws were breaking off big pieces and scattering small ones which the smaller ants were carrying away; .. and much more!

It was a most enjoyable lesson. If this activity is done in a double period, the students can also put down their observations in writing. There are many different observations which students can continue to make, once they get interested, during their lunch break, at home, during school picnics, and so on.

b. I asked the students to do this activity at home. The next day, I found that most students had tried it. Many of them said that a crow was the first to get the food. One said that a dog got it, while one student said that a squirrel got it. We had a discussion on which were the quickest and boldest animals living around us. Some students had seen crows swooping down to catch food in the air. They said that sparrows are the only birds that are bold enough to come inside our house. Rats are bold, but only in the night.

The observations in this activity will be very different in places where there are fewer people and so fewer crows! For example, other kinds of birds may find the food.

2. Flower visitors *(1 period for discussion of Activities 2-3)*

Activities 2 and 3 might be best done by students on their own, but talking and writing based on these should be done in the classroom.

We have some lantana bushes (called *tantani* by the children, or *ghaneri* in Marathi) which have flowers for most part of the year. I often see bumblebees and butterflies there. The best time is, towards the end or just after the monsoon season.

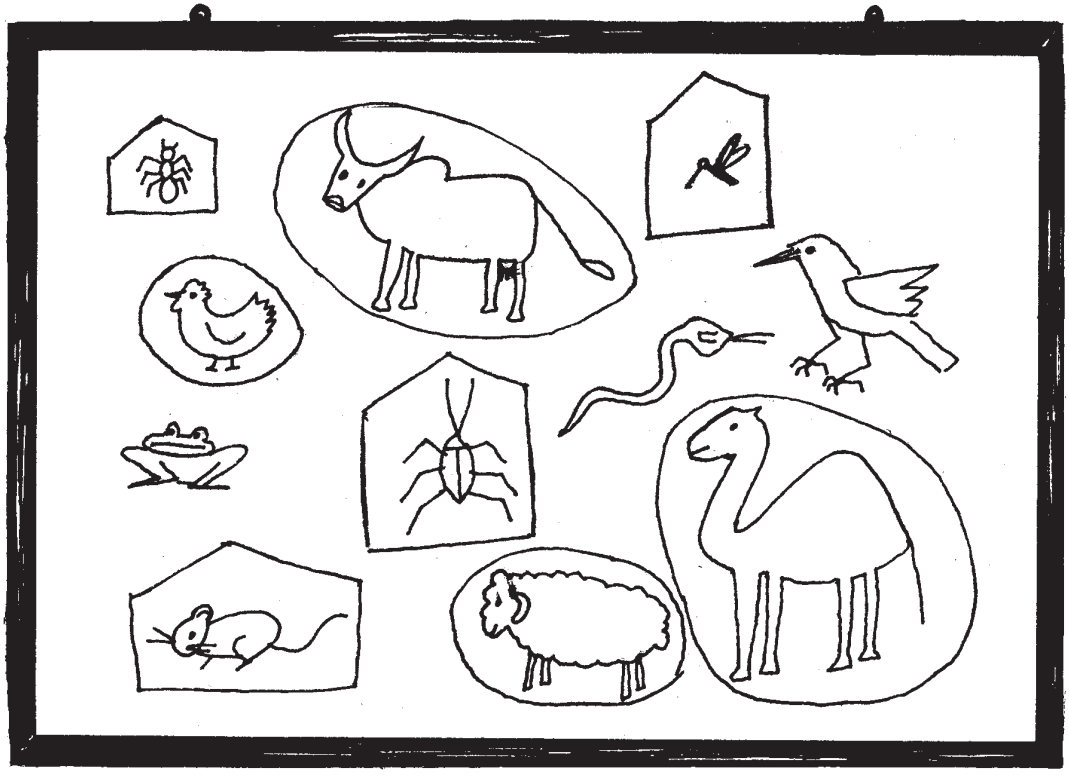
Students noticed that butterflies have different ways of flying. Some moved very quickly, while others sat on the flower for a longer time. Watching with care, they could see the butterfly unrolling its proboscis (sucking tube) to drink the nectar from flowers.

3. Birds

Students named and described the birds they had seen. Many of them had learnt to imitate bird sounds very well. I asked them to make a collection of bird feathers which they brought to class, and then guessed which birds the feathers belonged to. Looking at the colours of the feathers, they also became more observant of the colours of birds. For example, although crows look black, they have many grey feathers too. Pigeons have multicoloured feathers on their neck. Students also guessed that the large feathers must have fallen from the wings and tail, while the small (downy) feathers might have come from the rest of the body.

> Winter is the time when many new birds come from the North. They are migrating to warmer climates. Early summer (spring) is the breeding season for many birds, and at this time you see and hear more numbers of the local birds. Koels and other birds are heard in this season.
>
> Birds like to sit on trees which have tasty fruits or flowers. Under some trees you find many half-eaten flowers, fruits or seeds. That means some birds or animals have been eating them. Flowers of mango, palash, mandara, red silk cotton, .. are liked by birds. Fruits of mango, guava, pomegranate are also tasty. Banyan and peepal trees have fruits for a large part of the year, and they are very attractive to birds.

BLACKBOARD WORK



Draw the pictures on the board. Call students to the board. Ask them to draw a ⌂ around the animals we find in our homes and a ⬭ around the domestic animals.

SUMMARY

The chapter deals with animals that live in and near our homes. Many of them are pests and scavengers, who have learnt to live with us and eat the things that we eat. If there are too many of these animals, we find them troublesome and call them 'pests'. Students may give other examples, like white ants, moths and silverfish.

The textbook also gives examples of animals that are useful to us. Students often do not realise how important birds, frogs, earthworms, lizards and snakes are to us. They keep pests under control. There are many other animals which live around us, which are not obviously useful or harmful, but they are all part of the web of life.

Domestic animals are not described here in detail, since students would have learnt about them Stds.I and II. This knowledge is recalled through the exercises.

In some parts of the world, people rear insects for food. Common insects kept by people are honey bees which give us honey, and silk worms which make a cocoon out of a fine thread which we use to make silk cloth.

MORE OBSERVATIONS *(2 periods + daily observation)*

Besides the activities in the textbook, you can also do other simple observation activities, in which you catch and keep a small animal for some time, in almost natural surroundings, so as to observe it carefully. An easy way to watch small animals, like insects, is in a terrarium. A terrarium is an enclosed space where you can keep and watch land life, just like an aquarium is a space where you can keep fish and other water life.

All this may sound difficult at first, but it is really quite simple. There are always some students in every class who find the activity easier than teachers do. These are often the students who are less academically inclined, and such activities are a good way to keep them involved. Through the activities, they learn to care for animals, and to talk, draw and write about what they observe.

Before catching the animals, you should discuss with the students where these animals live, what they eat etc. They should only catch animals that they are able to look after. Normally, after two or three days of observation, they should release them.

Example 1: Ant-lion

The terrarium could be as simple as a bowl of sand in which you keep an "ant-lion" - a small harmless larva of an insect which makes a small cone-shaped pit in dry soil or sand, and waits for ants to fall into it. If you keep some sugar or biscuits on the sand, you will attract a stream of ants, which the ant-lion will catch with its jaws.

You can find ant-lions inside their cones - children are very good at finding them! Scoop up the sand with a spoon, and you will catch the ant-lion with it. Transfer it to your bowl. After some time the ant-lion will feel compfortable enough and start making its cone.

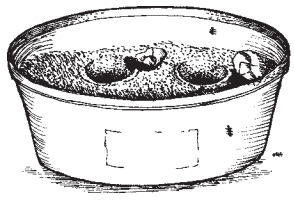
Ant-lions can not live in wet mud. Before the rainy season, they make a round cocoon around themselves. In a few weeks, a fly with long delicate wings emerges from the cocoon.

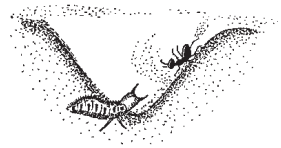
Keep the ant-lion in its dry sand bowl overnight, preferably near a source of ants. The bowl should not be disturbed, otherwise the ant-lion will stop moving. Even after the cone is made, the bowl should be handled gently. if children disturb the sand, the cone will be upset.

Student's writing on an ant-lion

The ant-lion

The ant-lion is round and brown.
It hides in the sand.
It walks forward and back.
It kicks the sand when it walks.
It makes a cone.
The ant falls in the cone.
The ant-lion eats the ant.
The ant-lion is bad





Student's questions:

Why does the ant-lion hide?

To escape enemies and to hide from its prey. It has big jaws but a soft body and is quite defenceless.

Example 2: Grasshopper

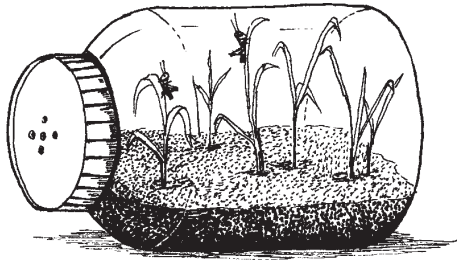
You can also make a terrarium out of a large plastic jar, in which you make holes with an agarbatti. Put some mud in the jar and plant some grass (or any cereal grain from the kitchen). Tie a piece of cloth over the mouth of the jar so that you can water the grass through it.

This is a good place to keep grasshoppers and crickets. Students could catch the grasshoppers by quickly keeping an upturned plastic container above them. After transferring them carefully to the terrarium, students can watch the grasshoppers jump, eat grass in different ways, and drink drops of water. They can see that they prefer light during the day. If you are lucky, you may even have them mating, laying eggs in the terrarium, and a brood of baby grasshoppers hatching out!

Student's writing on a grasshopper:

The grasshopper

The grasshopper is green.
It sits on the grass.
It eats the grass.
The grasshopper jumps high.
The grasshopper broke off a piece of grass.
It held the grass between its legs and chewed it.
One grasshopper is sitting on the mud.



Example 3 Spider

In the same way, you can catch and keep jumping spiders in the terrarium. If you keep some bananas or sweet grapes in the terrarium, tiny fruit-flies or ants will come and enter into the

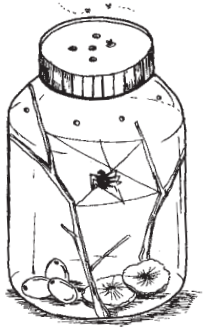
terrarium through the holes. The spider will catch and eat them up. Sometimes a spider might make a web or part of a web inside a terrarium.

You can also ask students to watch out for a free spider-web. Fascinating happenings in a spider web include a spider making or repairing a web, spinning an egg-sac in which it stores its eggs, the baby spiders and their baby webs, and much more!

Student's writing on a terrarium spider:

The spider

The spider is in the jar.
It is brown and white.
The spider has big black eyes.
The spider has eight legs.
The spider runs very fast.
It jumps.
Birds eat the spider.



Discourage cruelty

Through the study of plants and animals, we want to convey a respect for all living things. While observing the behaviour of insects, students should try not to disturb their normal activities to the extent possible. Often, students are thoughtlessly cruel to small animals and plants. They casually crush insects, or uproot small plants. Some boys like to catch insects and tie strings to them or trouble them in other ways. This happens often in students from deprived urban backgrounds.

I had to think of how to discourage students' thoughtless cruelty. When I asked them why they were cruel, they answered that the insects would bite them. Some girls said they were just afraid of all insects, snakes and lizards. But they agreed that if left alone, neither the animals nor the plants would trouble them. I told the students that like us, all animals and plants were living, and they needed our care. Besides, we were here to learn more about

animals and plants. If we killed them, How could we learn about them?

I also told students about how many of the small animals were useful to us in controlling pests and fertilizing the soil. Without them, larger animals could not survive.

I think that this practical approach appealed to them better than just saying that cruelty is bad. Afterwards, when they had made more observations on behaviour of animals, they became interested in watching them rather than killing them. In the same way, when they started calling the trees and plants by their names, they were more caring about them.

EXERCISES *(7 periods + home-work)*

Observation-based exercises

Name and Draw

1. Different kinds of animals which live in or around your home or school

a. Two-legged animals
   Birds and humans
b. Four-legged animals
   Dogs, cats, lizards etc.
c. Six-legged animals
   Insects in the surroundings
d. Eight-legged animals
   Spiders
e. Many-legged animals
   Millipedes, centipedes

Short questions

1. Name one domestic animal that is found in desert lands.
   Camel

2. Why do crows, sparrows, rats and dogs live near our homes?
They get their food from us. Ask students to give examples from their experiences

3. Name three animals that:

a. Give us milk
cow, buffalo, goat, camel

b. Give us eggs
hens, ducks, geese

c. Give us wool
sheep, goat, camel

d. Carry or pull our loads
bull, donkey, horse, camel

e. Suck our blood
mosquito, bedbug, lice, flea

4. Write the names below from smallest to largest animal.
rat, donkey, dog, elephant, mosquito, camel
mosquito, rat, dog, donkey, camel, elephant

What's same? What's different?

1. Give two similarities and two differences between:

a. Dog and cow
Both have four legs, two eyes, a tail, both give milk to their young ones. Cows are big, have hooves and horns, eat grass. Dogs are smaller, have claws and no horns, eat meat.

b. Butterfly and cockroach
Both have six legs and wings. Butterflies fly high and suck nectar, cockroaches rarely fly and eat other food. Butterflies we find attractive, cockroaches we usually find repulsive.

c. Crow and sparrow

Both have wings and a beak, both live near our homes. Crows are black and larger than sparrows, they eat many things including dead animals. Sparrows are brown, white and black, they eat grains and insects.

2. Find the odd one out:

a. Dog, cat, *tiger*, cow (Not a domestic animal)

b. flea, mosquito, bedbug, *housefly* (Does not suck our blood)

Look, tell and write

1. Talk about about how different animals behave. Some are quick and bold, others are shy and do not come close even if you offer them food. Some are active in the day, others in the night. Some move in groups, others stay alone.

Crows, sparrows, dogs and squirrels are quick and bold. Mice, lizards and most birds are shy, unless they have been tamed. Bats, rats, mice, cockroaches and owls are active in the night. Many common birds like crows and sparrows move in groups in the mornings and evenings.

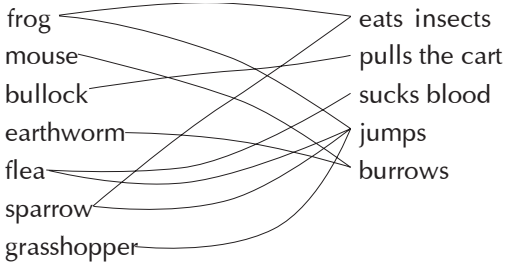
2. Write about any one animal that lives around you.

Student's writing on earthworms:

Earthworms are black and red.
They do not have legs.
We see them after the rains.
Earthworm looks like a baby snake.
Earthworm moves differently from a snake.
It moves slower than a snake.
It feels soft on our hand.
It does not bite us.

Play with words

1. Match the animal with one or more actions.



Ask and find out

1. Do you have a pet at home? How do you take care of it? If you do not know, find out from older people.
Example (taking care of a pet dog) Feed it, keep it clean, give it a place to stay, make sure it gets exercise, and affection too.

2. Some of you eat fish at home. What are the different names of fish that you know? Do these fish live in fresh water (lakes and rivers), or in salt water (sea)?
The names will be different according to locality and language spoken. Encourage students to observe and draw the fish

Figure it out

Quantitative thinking

1. A sparrow flew back and forth from its nest to bring insects for the baby sparrows. In one minute, it brought two insects. How many insects did the sparrow bring in 30 minutes?
60 insects. This is a good estimate of how much baby sparrows can really eat!

SUPPLEMENTARY EXERCISES

The exercises in the textbook are mostly open-ended. You could frame questions or riddles more appropriate to the environment of your students. For example:

Observation-based exercises

Riddles

1. Tall and straight and has a brush at its top? (coconut/ date palm ..)

2. I have a long tongue and catch insects with it. (frog, chameleon, woodpecker ..)

3. I have a flat beak and webbed feet. Who am I? (duck, goose)

4. I hide in the day, come out at night. (owl, bat, rat, cockroach, firefly, moth)

(Many such examples can be constructed. Students will enjoy the guessing game.)

What's same? What's different?

Make up examples appropriate to your surroundings, which encourage students to observe closely. For example:

1. Give two similarities and two differences between:

a. Coconut palm and betelnut (or another kind of) palm
b. Rose bush and mogra bush
c. Grass and clover (small plant with heart-shaped leaves that grows with grass)
d. Frog and grasshopper
e. Human and monkey
f. Crow and bat
g. Sparrow and fly
h. Cow and goat
i. Two breeds of dogs
j. Jungle crow and house crow
k. European or American and Indian cows

l. Cow's milk and goat's (or buffalo's) milk

2. Find the odd one out:

house-lizard, *crow*, snake, chameleon (A bird)
neem, banyan, coconut, *hibiscus* (Bush, not tree)
rose, *champa*, mogra, marigold (Grows on a tree)
groundnut, cashewnut, almond, pistachio (Grows under the ground)

Language development exercises

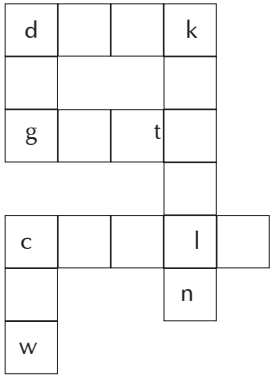
Talk and write

Five lines on:

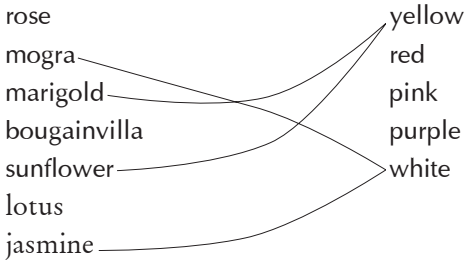
a. I saw a dog ...
b. I saw a bird ...
c. I saw a spider ...
d. I watched some ants ...
(where were they, what did they look like, what did they do?)

Play with words

1. Fill in the names of domestic animals:



2. Match the plant with the colour or colours of its flowers:



The flowers of rose, lotus and bougainvilla are found in all the colours.

OUR BODIES, OUR FOOD

Main Index

UNIT 2 Our bodies, our food

AN OVERVIEW

Objective

To introduce students to what lies inside our body, the connection between food and growth, healthy habits, cleanliness and other care of the body:

2.1 Names and uses of body parts including sense organs.
2.2 Action words for body parts
2.3 What we are made of:
(Elementary idea of skin, muscles, blood, bones, joints)
2.4 Relating growth with food
2.5 Three main food groups
2.6 Cereals and Pulses (Common or local names)
2.7 Vegetables and Fruits (Common or local names)
2.8 Eating clean food
2.9 Care of teeth
2.10 Body cleanliness
2.11 Body exercises and rest

What is new in this Unit

In standards one and two, students have learnt the names of parts of the body, and have been introduced to the sense organs. This information is revised. Some new words for body parts and actions are also introduced, in a lighthearted way. Then we raise the question of what is inside the body. It is sufficient if students know the terms skin, blood, muscles, bones and joints. No details are expected.

In the next chapter, the food groups are introduced. Here we emphasise the role of the nutrients belonging to different food groups. The words 'carbohydrates,, 'proteins' ...etc.

Main Index

are avoided, to reduce unnecessary information. Students should understand the functions and importance of different foods, not just learn terminology.

Our traditional diets contain a large variety of cereals, pulses, vegetables and fruits. With the increasing use of standard processed foods, there is a danger that this variety might be lost. Students should therefore observe and know about all the locally available foods. The English names for all these are not expected. Common names of cereals, pulses, vegetables and fruits in English, Hindi and Marathi are given in the Glossary.

In the last two chapters of this Unit, students learn about care of teeth, personal hygiene, and the importance of exercise. We ask them to examine their own personal habits without embarassment, and correct them where necessary.

Time-table

P: Number of periods

Chapter 5

P1	- Story
P2 - P5	- Activities
P6 - P7	- Summary
P8 - P15	- Exercises

Chapter 6

P16	- Story, Introduction to Activities
P17	- Activity 1
Field trip	*- for Activity 2*
Activities 3 & 4 to be done as home-work	
P18-P20	- Summary
P21-27	- Exercises

Chapter 7

P28-P29	- Activities
P30-P31	- Summary, Exercises
P32-P34	- Exercises

Chapter 8

P35	- Story
P36 - 38	- Activities
P39-P40	- Summary
P41-P44	- Exercises

CHAPTER 5

Our bodies

STORY

Mini's fall

It was Sunday afternoon. Mini was curled up in bed after a good lunch. The sun went low in the sky, but she was fast asleep.

Apu came quietly up to her with a feather in his hand, his eyes shining with mischief. He tickled Mini's arm with the feather, then he tickled her leg. Mini did not stir.

He tickled her palm, and she moved a little. Then he tickled her nose.

Aa .. aachoo .. oo

Mini's sneeze blew the feather out from Apu's hand. "Wake up", cried Apu, "let's go out to play!".

They ran out to the big Banyan tree. Mini loved to swing from its smooth hanging roots.

She held the roots with fingers tight,
And swung her legs with all her might.

She bent her knees and curled her toes,
She breathed so hard, it puffed her nose.

She arched her back, her feet went high,
"I'll greet the birds, I'll reach the sky!"

Apu looked at her with envy, "You should be in the circus, Mini!". Just then Mini took an extra high swing - her fingers slipped from the root and she fell to the ground with a thud.

Main Index

"Mini's knees and elbows were bleeding, her chin was scratched. She tried not to cry, but tears trickled down her cheeks.

Apu took her home to Amma. He helped Amma clean her wounds.

"Where is this blood coming from?" Apu wondered.

"Blood flows in big and small tubes in our body", said Amma. "Just under our skin, there is a net of *very* thin tubes, with blood flowing in them."

"But why is the blood coming out of the tubes?"

"Mini's skin is torn; some of these tubes are torn too. That is why the blood is coming out."

"When will it stop coming out?"

"Apu, you ask so many questions! Get me the cotton now."

By now, Mini was forgetting her pain.

"What else is there under the skin?" she asked.

"Muscles. We call it flesh."

"And under that?"

"Bones"

"And under that?"

"Nothing. Bones support your whole body." Amma slipped her fingers under a large handkerchief, and lo! It moved like a puppet! "That is how bones hold us up and let us move. Without bones, .. " She took her hand out and the handkerchief flopped down.

Mini and Apu laughed. Amma had not answered all their questions, but they were going to watch, and ask, and read, until they found out everything! But now, they wanted to run out to play.

ACTIVITIES

Know your body

1. Action words

Do these actions. Say which part of your body you are using.
walk, jump, run, hop, skip, crawl, somersault,
nod, blink, wink,
breathe, smell, sniff, sneeze, cough, blow,
bite, chew

2. Touch and feel

Take a feather or a thin, rolled-up corner of a handkerchief. Close your eyes. Ask a friend to touch you lightly with the feather, brush or handkerchief, anywhere on the body.

Do you feel the touch on all parts of your body?

On which parts of your body do you feel even a very gentle touch?

On which parts of your body do you not feel any touch?

3. Smell and tell

Close your eyes and smell different things. Which of them can you recognise? You may smell:

Water, milk, any fruits, your favourite food, onion, garlic, spices in the kitchen, a new book, a very old book, a fresh newspaper, pencil, eraser, any flowers, leaves, kerosene, leather ...

4. Finger puppet

Take a large handkerchief. Put your hand under it. Tie a string or a rubberband as in the picture. Do not tie it too tight.

This is your finger puppet. Make your puppet clap hands, bend forward ... What else can your puppet do?

Now take your hand out. Say what happened.

What is it inside your body that lets you stand, sit, move and dance?

5. You are growing

Do this with an older or younger friend: put your palms against one another. Compare the size of your hand, the length of your fingers, the length of your arms, your feet and your legs.

Draw the outline of your palm in your WorkBook. Write the date next to your drawing. At the end of the year, put your palm on the drawing again to check if it fits.

Think! Think!

As you grow, your bones grow bigger, your muscles grow bigger. More material is added to your body. Where does this material come from?

SUMMARY

Remember this

What you are made of:

Skin

Your body is covered with a skin, just like a mango is covered with a peel.

You touch and feel things with your skin.

There are some parts of your body that are not covered with skin. Guess what these are!

Which parts of your body can you cut off without feeling anything?

If you get scratched by thorns, or fall down and graze your skin, then the thin outer part of this cover comes out. You see the smooth and pink inner part of the skin. Underneath the skin are our muscles.

Muscles

Muscles are the fleshy parts of your body. Feel the muscles of your face, your upper and lower arms, your thigh and ankle. Your largest muscle is in the hip and thigh. Muscles help us to move.

Do you eat mutton, chicken or fish? What you eat are mostly the muscles of these animals.

Blood

When you hurt yourself, you see blood coming out from the wound. Blood reaches all parts of the body through many thin tubes.

Bones

Bones are the hard parts of your body. You can feel bones where they are close to your skin: in your wrists, elbow, base of the neck and knees.

In some parts of your body, the muscles are quite thick. Here you can not easily feel the bones. But they are there! If you did not have bones, you would collapse like a lump of dough.

Joints

Our bones are hard and stiff. We cannot bend bones. But with the help of our muscles, we can bend some parts our body. These are the parts where two bones meet. We call them joints.

Move your fingers, toes, arms, legs, neck, waist. Guess which parts of your body have joints.

Growing bigger

Your body is growing every day. Clothes that you wore two years ago do not fit you now. They are too tight, and too short.

When you were a baby, older people in your family used to carry you easily. Now it is not so easy for them to carry you.

You cut your nails and hair, but they keep growing longer.

All parts of you grow. Your bones grow, your muscles grow, your skin grows. Your body makes more blood.

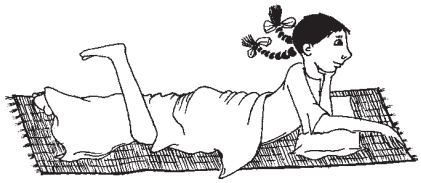
Know these words

Show these different parts of your body.

head, hair, neck, shoulder, trunk, back, chest, waist, belly, hips, buttocks
face, forehead, eyes, ears, nose, mouth, lips, teeth, tongue, chin
arm, elbow, wrist, hand, palm, fingers, thumb, nails
leg, thigh, knee, shin, calf, ankle, foot, toes

DID YOU KNOW?

- You have about 100,000 (one hundred thousand) hairs on your head!
- About two-thirds of your body is made of water. Water is part of your skin, muscles, blood and even bones.
- The smallest bone in your body is in your ear.The longest bone in your body is in your thigh.



teaching ideas

STORY *(1 period)*

The students followed the story, although I had to explain many of the words. The names of body parts and the activity words, like curled, tickled, puffed, arched etc., were clear when students did those actions.

Some of the students noticed that Amma had not answered Apu's question about when the blood would stop coming out. When I asked them, one student answered that the blood dries up and stops more blood from coming out. This was a good response! I told them that a wonderful thing about blood is that it dries up very fast when it comes out of the body. And the wonderful thing about our body is that it repairs itself! It makes more blood and it builds up the torn parts of blood vessels and the skin. To do this, the body needs food. I told them we would be learning about body-building foods which are used by our body to repair itself.

At the end of the story, I showed them the finger puppet with my handkerchief, but left the activity for the students to do in the next class. After completing Chapters 5 and 6, I read the story once again. This time the students understood it better.

New words in the story:

curled, tickled, swung, breathed, puffed, arched, greet, slipped, scratched, trickled, mischief, sneeze, envy, thud, muscles, bones, support, puppet

ACTIVITIES

1. Action words *(1 period)*

The action words are given mostly for fun and some language development. I explained

the colloquial usages, asking students to do the actions rather than giving them definitions: 'crawl' (walk on hands and legs), 'sniff' (quick noisy inward breath), 'hop' (jump forward on one or both feet), 'skip' (jump forward on each foot alternately, or 'skip' with a rope), 'blink' (quickly open and shut both eyes) and 'wink' (blink one eye). Students did not know the difference between 'bite' and 'chew' (biting is a single action, chewing continues for some time).

2. **Touch and feel** *(1 period)*

You need: Handkerchief or feather or paintbrush.

This activity had been introduced through the story in the earlier class. It was followed by a discussion of the things we can feel with our skin, for example, warm or cold; wet or dry; smooth, rough or ridged; hard, soft or springy; flat, rounded or pointed; sharp or blunt.

I also asked students to do an activity in which one student traced with a finger, on the back of another student, a numeral or a letter of the alphabet. The other student had to guess what was written.

The questions:
On which parts of your body do you feel even a very gentle touch?
Some very sensitive parts of the body are, palm of hand, inside of ear and nose. These are also the parts were you get tickled!

On which parts of your body do you not feel any touch?
Hair - especially the tip of long hair, nails. These parts are not covered by skin nor supplied by nerves.

3. **Smell and tell** *(1 period)*

You need: A few things of daily use to smell.
I asked students to list the things that they could guess by their smell, starting with the examples given in the TextBook. Many were not sure if they could smell water. Some said that water from the tap smelled different from well water.

When asked for examples of smells that they could recognise, students listed an astounding 136 items! These included 16 raw vegetables and 21 fruits. They mentioned that when the fruit is freshly cut, the smell is stronger. Other examples included 8 kinds of spices, 9 kinds of flowers, and 9 kinds of sweets (like shrikhand, jalebi and gulabjamun). There were 24 kinds of other cooked foods in their list.

Students also said that they recognised the smell of some animals, like cows, goats, pigs and peacocks. They listed 42 everyday smells like hair-oil, soaps, kerosene, diesel, tar, gunny (jute) bags, pencil, ink, cowdung, body odour, burning coconut fibre, burning rubber, wet soil, and many others.

I had brought samples of a few things like coconut oil, garlic, asafoetida (*hing*), and I also took some things from the classroom, like an eraser, metal pencil box, and a lunch box with food. Students were able to recognise these with their eyes closed.

4. **Finger puppet** (*1 period for Activities 4-5*)

You need: One handkerchief and one string or rubberband per student.
The finger puppet activity was followed by the exercise of writing what the puppet can do.

5. **You are growing**

This was a simple activity. The idea that new material has to be added to the body was a little puzzling for students, but I explained this later, with the summary.

SUMMARY (*2 periods*)

Remember this

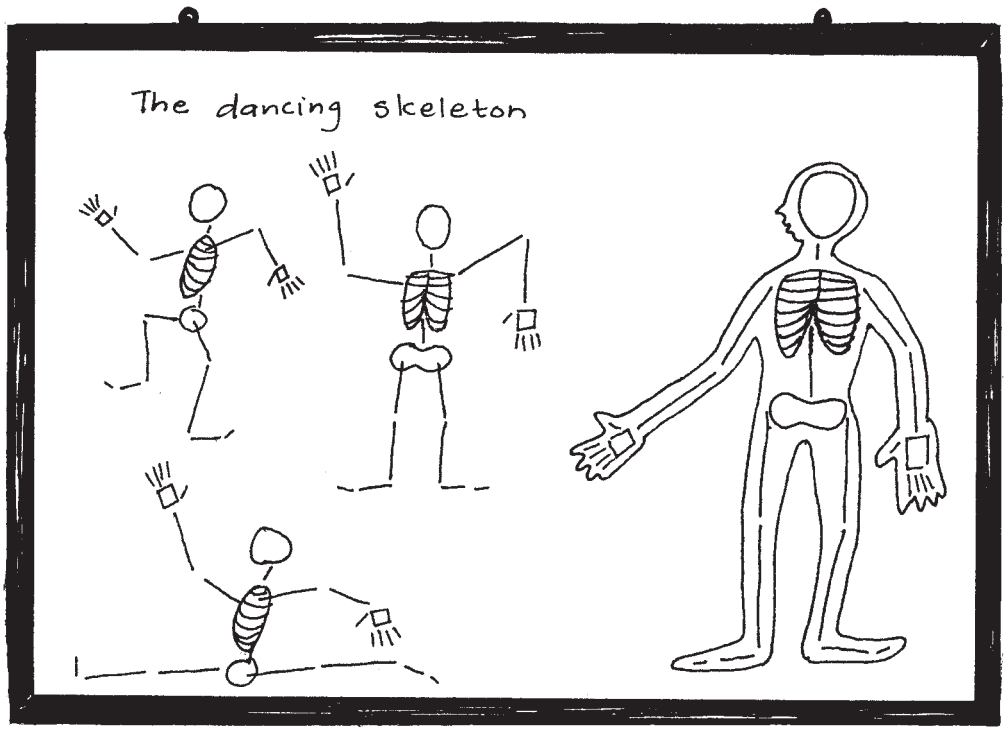
What you are made of

I read out the summary with small activities and explanations. The parts of the body not covered by skin are nails, hair and teeth. Since you feel with your skin, you can cut your nails and hair without feeling anything.

> The largest muscle in our body starts from the buttocks and goes down the thigh up to the knee. Its Latin name is *Gluteus maximus*.

I explained the idea of blood vessels by asking students to search for tubes in their body. You can see some of these tubes where they are close to the skin. I asked students to look on the neck, wrist, back of the hands, upper part of the feet, and inside of the elbows and knees.

BLACKBOARD WORK



Draw a skeleton on the blackboard doing different actions. Ask the students to do these actions and tell which joints are being used. Next, hold the chalk sideways and trace over the skeleton. These indicate the muscles. Finally draw the contour of the body to show the skin.

> The largest bone in the body is the thigh bone (*Femur*). It is about a quarter of your total height. The smallest bone in the body (*Stapes*) is in the inner ear. It is about 2.5 - 3.4 mm in length.

By trying out different movements of their body parts, students guessed in which parts the bones were joined neck, shoulders, elbow, wrist, finger (3 joints), back (can curve because of several joints), leg, knees, ankle, toes. The immovable joints are not mentioned in the text, so I did not deal with those.

I introduced growth by comparing the students' height, the size of their palm, the size of their feet etc. with my own. I told them, one day they will be as big as me or even bigger. Where will the extra stuff come from?

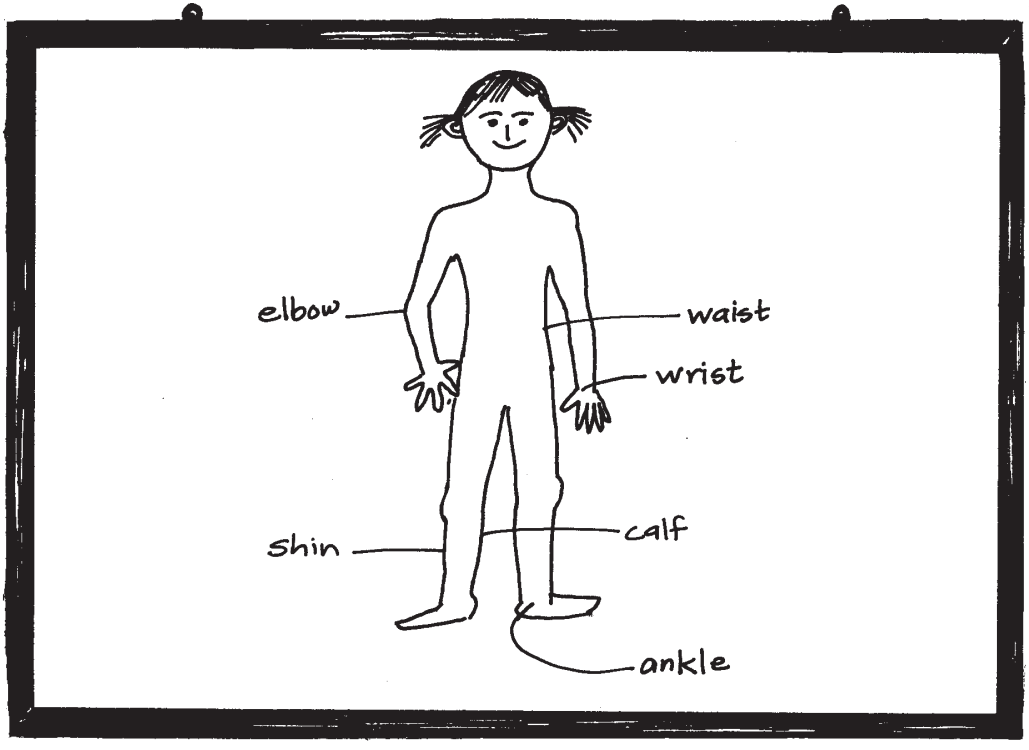
Growth

It is quite obvious to us that food makes us grow. However, many students in the primary school do not clearly understand the connection between food and growth. They have to concretely realise the fact that some material needs to be added to the body in order that it grows. This material comes from the food we eat.

Know these words

I asked students to point out the body parts. Some were difficult -they confused 'wrist' with 'waist', and did not know some words like 'elbow', 'shin', 'calf' and 'ankle'.

BLACKBOARD WORK



Draw this figure on the blackboard and ask the students to come and label the different body parts.

EXERCISES (*8 periods + home-work*)

Quantitative thinking

Count!

1. You have one nose. What other things do you have only one of in your body? What things do you have two of?

a. I have one
head, neck, trunk, back ...

b. I have two
eyes, ears, arms ...

c. I have ten
fingers, fingernails, toes ...

d. I have more than 20 but less than 30
teeth

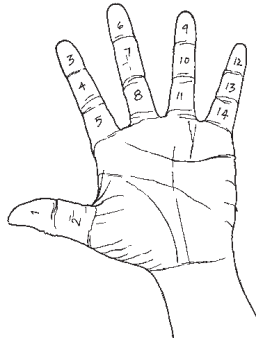
e. I have so many of these that I cannot count them
hair

2. Count with your fingers

You know how to use your fingers to count numbers up to 10. How can you count numbers bigger than 10 with your fingers? Think!

The children puzzled over the problem of counting above 10 with their fingers. Some used their toes to count to 20; others started 11 from the first finger again, but did not know how to keep count of the tens. They came up with other different ideas, like, counting parts of their face - eyes, eyebrows, eyeballs, nose, mouth, teeth, etc... They went on to count different parts of the body that totalled to more than a hundred! But soon they realised that without remembering the order in which they had counted these body parts, they could not use them to count anything else.

I then showed them how to use the joints on the fingers to count up to 16 on four fingers. They remembered that they had seen some elders count in this way. Some of them used finger segments as shown in the figure while some used joints of four fingers to count up to 16. I also showed them how to count in cycles of tens and to use the fingers of the other hand to keep track of the tens. In this way they could count up to 50.

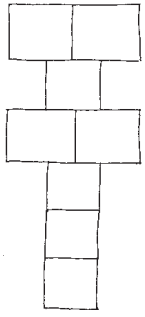


Observation-based exercises

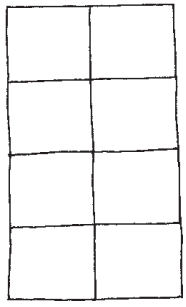
Short questions

1. **The three pictures on page 27 show the same hand. Is it a left hand or a right hand?**
   Left.

2. **Which parts of your body do you use in the different games you play:**
   marbles, lagori, hopscotch, cycling, swimming, ... ?
   I introduced body parts by talking about different games that children play. Some names of games in the textbook were not known the students, but they knew the games under different names. Hopscotch is a skipping game played by girls on a pattern drawn on the ground. Some students called it 'aeroplane'. In lagori seven flat stones are piled and hit with a ball. It is known as 'seven tiles' or 'pitthu' in some parts of India.



Hopscotch patterns



lagori stones and ball

I also used other examples from the students' experiences, like, 'langdi', 'four pillars', 'bat-ball' and 'chain-chain'.

I told them the difference between actions using fingers (playing marbles, threading a needle), or hand (writing, moulding with clay) or the whole arm (playing ball, swimming).
I asked students to think of different actions with the body parts.

Some examples of students' responses:

*I peeled a mango with my **teeth**.*
*My sister tied rakhi on my **wrist**.*
*My brother sucks his **thumb**.*
*I get hurt on my **knees**.*
*Elephant, donkey, horse and camel carry load on their **back**.*

3. What are all the different things you can do with your:

a. Eyes
see, blink, wink ...

b. Nose
breathe, smell, sniff, sneeze, blow ...

c. Mouth
talk, eat, whistle, blow ...

d. Ears
hear, fold, waggle, wear earrings ...

e. Hands
Most things you do through the day use your hands ...

4. Which parts of your body do these things?

a. see (eyes)

b. hear (ears)

c. taste (tongue)

d. smell (nose)
e. feel (skin)

All the students were familiar with three of the sense organs (eyes, nose and ears). Some knew we taste with the tongue, others thought it was the mouth. They thought we feel with the fingers, so I reminded them of the *'Touch and feel'* activity and the idea of skin. We feel with the skin which covers the whole body.

> The different tastes we can tell are, bitter, sour, sweet and salty. The hotness of a chilly os not a taste- it is just a burning sensation in the mouth. We get the flavour of food by taste as well as by smell. We know this when we get a cold with a blocked nose, and food seems tasteless.
>
> Our ears help us to balance as well as to hear.

5. Which parts of your body let you know these things?

a. There are stars in the sky. (eyes)
b. The mango is sweet. (tongue and nose)
c. A fly is sitting on your forehead. (skin)
d. A baby is crying in the next room. (ears)
e. There is fish in the covered basket. (nose)
f. The paper is smooth. (skin and eyes)
g. A truck is passing behind you. (ears)
h. A man is coming along the road. (eyes)
i. The pot is warm. (skin)
j. There is too much salt in the food. (tongue)
k. Someone has lighted an agarbatti. (nose)
l. A cool breeze is blowing. (skin)

6. Feel these parts of your body and say if they have bones:

leg, palm, head (have bones)

lips, ears, belly (don't have bones)

Some students said they could feel bones in the ears. I told them they could fold and bend the ears - with bones you can not do that. Our ears and nose are made of cartilage, which is softer than bones.

What's same? What's different?

1. Give two similarities and two differences between:

a. Arms and legs

We have two of both. Both are fixed to the trunk. We need both for swimming. Arms stay up, legs stay on the ground. With the arms you can lift, throw etc., with legs you can walk, kick. Some people who have lost their arms learn to do many things with their legs and feet, even writing and painting.

b. Fingers and toes

We have ten of both. Both have nails. Fingers are part of the arm, toes are part of the leg. We can do many more things with fingers.

c. Mouth and nose

Both are part of the face. We can breathe or blow with both. We talk and eat only with the mouth. We smell only with the nose.

d. Bones and muscles

Both are inside our body. Both grow bigger as we grow up. Bones are hard and white, muscles are soft and pink. We can bend muscles, but cannot bend bones. Bones hold up the body and give it shape. Muscles, with the help of bones, make us move.

Talk and write

Language development exercises

1. Tell your teacher:

Before students did this exercise, I introduced some verbs. Some of these verbs were unfamiliar, so I asked students to do the actions in class.

a. What I do with my arms

I used the verbs: swing, raise, stretch, wave, throw, ... The class talked about different actions they do through the day with their arms.

Students also wrote some sentenses:

What I do with my arms

I swim.
I write.
I play bat-ball.
I have a bath.
I wash clothes.
I play in mud.

b. What I do with my legs

I used the verbs: walk, march, step, hop, skip, jump, dance, kick, climb, crawl, ...

Some sentences written by students:

What I do with my legs

I stand.
I pedal the cycle.
I play karate.
I climb a tree.
I walk home.

c. What I do with my mouth

I used the verbs: talk, eat, bite, chew, spit, blow, whistle

2. What my puppet can do

(What are the different actions that your finger puppet can do?)

Clap hand, bend head, pick up small things, peck someone's nose, hold its head, dance.

This exercise was done along with a puppet activity. Students did all the actions with their puppets and then wrote them down.

3. How I hurt myself or When I fell down

(Where did it happen? How did it happen? Which parts of your body did you hurt?)

I asked some students to come forward and describe an incident when they fell down. As they spoke, I repeated their sentences, casually correcting the words and grammar. Later the class wrote their essays in their WorkBooks.

Sample essay (Not corrected):

One day I was playing in the garden.
My manoj friend hit me on my stomach.
My stomach is paning.
I back hit the Manoj on his elbow.
My stomach is paning. I run to my grandmother.
My grandmother told manoj. Why you hit my son.
My father took me to the hospital
and told the doctor himanshu's stomach is paning.
Doctor told you take this medisons.
My daddy take the medisons and go to the home.

Play with words

1. Fill these blanks to make five different sentences from each of the following:

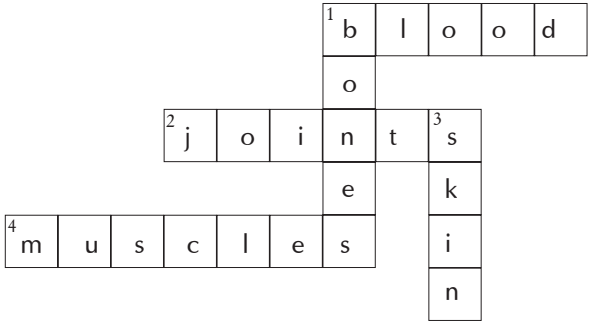
a. I use my ____ to ____ .

b. My ____ joins my ____ to my ____ .

I use my arm to throw.
I use my fingers to write.
I use my lips to blow bubbles.
I use my head to carry.
I use my head to think.

My neck joins my head to my trunk.
My waist joins my trunk to my hips .
My wrist joins my fore-arm to my palm.
My thigh joins my hip to my knees.
My ankle joins my calf to my foot.

2. Fill the squares!



Across:

1. It flows through our body in tubes.
2. Places where two bones meet.
4. Fleshy parts of the body. They help us to move.

Down:

1. Hard and white and inside our body.
3. We touch and feel things with this.

Ask and find out

1. **How do blind people find their way around? Can blind people read books?**
   All the students had seen some blind people. They guessed that blind people found their way around by using a stick to tap the ground and other things. Some of them knew a partially blind boy who had lived for a while in their hostel. For a few days they had to lead him around to the bathroom etc., but soon he had become self-reliant. These students had seen the blind boy 'read with the help of his fingers', but they were not sure how. They guessed that the letters might be large and raised. I told them about the Braille script for the blind.

   Some girls said it was due to their *'karmas'* in their previous birth that they got this punishment. I asked them how anyone could know this. Individually, such ideas are difficult to challenge, but over time I expect the students to take more rational and sympathetic stands.

2. **Talk to someone you know, who cannot use some part of their body. Find out if he or she has learnt to do some things in a different way, and how.**
   In the class there is one girl who has a weak leg due to polio, and a boy whose one hand is limp. Both these children are quite active and well integrated with the others. The girl plays good 'langdi', while the boy boasts that he can lift weights, write with both hands by supporting one with his elbow, and also draw better than many others in the class! Children also exchanged other experiences about disabled people whom they had known or seen.

3. **Do you eat the flesh of animals? If you do not, ask a friend who does. Do different animals have different kinds of muscles and bones? Are there different kinds of muscles and bones in different parts of the body?**
   Most of the students in the class had themselves eaten meat, and were quite enthusiastic in talking about it. They mentioned the meat of goat, pig, chicken, fish, prawn and crab.

They had noticed the different colours and textures of these meats. They said that muscles of the goat were tough, while those of the fish were soft. They had seen the different colours and textures of different parts of the goat, like, heart, liver, kidney and brain. They knew that bones and other internal organs of the goat and pig were larger than those of the chicken. They called the fish bones 'thorns' rather than 'bones'. Children from the poor families ate more of fat, skin, bones and internal organs. One student, who was most knowledgeable about the parts of different animals, came from a *Chamar* family.

Students' questions about the body:

Why do we have different colours of skin?

Observe the colour of your skin, and that of your parents. Usually the colour is similar to one of the parents, or in-between them. Colour depends on the amount of a pigment called melanine in the skin. For people who work outdoors in the hot sun, you can see that the exposed parts of the skin become darker than the covered parts.

Why do we have lines on our palms?

Observe that many portions of our skin have lines. The lines are places where the muscles are attached to the skin. The skin can be folded along these lines.

What are the green lines on my mother's legs?

Those are tubes carrying blood which you can see in different parts of of the body, under the skin - observe these in your body. If the vessels are swollen you see them more clearly.

Is there water in our hair, teeth and nails?

These parts of our body not living. But they do absorb water from their surroundings. Notice that your hair feels different in dry and in wet weather. Hair is in fact used in a 'hair hygrometer' to measure humidity. Your nails too are softer when they have been in water for some time.

CHAPTER 6 Our food

STORY

The hungry kitten

Apu and Mini were on their way back from school. In school they had learnt about the food that their body needs. Suddenly, they saw a tiny black kitten, mewing sadly with its tail in the air.

"Poor little kitten", said Apu, "she looks thin and hungry!"

"Let's take her home and give her some good food", said Mini, picking up the kitten.

"Yes, what shall we give her?"

"She looks tired; she needs energy to run around and play."

"She is thin and small; she needs food to build up her body."

"She must not fall ill - she needs food to keep her well!"

Mini and Apu started making a list of good food for Kitty. Kitty arched her back, blinked, and swung her tail impatiently.

Meow .. MEEOW ...

Little Kitty, just you wait,
You'll have the best you ever ate.

Sweet rice, some butter for energy,
Eggs and dal for a growing body.

Fruits and veg to keep you fit,
That's what you need, little kitty kit!

Eat and play and lie on the mat,
You'll soon grow into a big fat cat!"

Apu, Mini, come and drink your milk", called Amma. Apu picked up Kitty and they ran to the kitchen.

Main Index

"Oh, we have a guest today!" said Amma.

"Yes, and here is what she needs to eat," said Apu, pulling out their long list.
"That is what *you* both need to eat, to grow into healthy children," said Amma, "What Kitty needs now, is some milk!"

Kitty lapped up her milk hungrily, jumped on to a soft cloth, and was soon fast asleep.

ACTIVITIES

Find out about food

1. Know your grains
Most of our food is made up of grains. The grains we eat are of two kinds, *cereals* and *pulses*.

Rice, wheat, ragi, bajra, jowar and corn are cereals. We use cereals to make rotis, porridge and many other things.

Toor, moong, masoor, udad and chana are pulses. We use pulses to make dal, sambhar, curry and many other things.

Bring to school a spoonful of one kind of cereal and one kind of pulse. Write the names of all the cereals and pulses brought by the whole class.

2. Visit the market
Visit a vegetable market. Write the names of all the vegetables and fruits you see there.

3. What you eat
Keep a list of things you eat:
The things I ate raw
The things I ate cooked

4. How much water you drink
Count how many glasses of water you drink every day.

SUMMARY

Remember this

Why you need food

Every day you feel hungry and want to eat something. Your body is telling you that it needs food!

1. Food gives you energy to work and play.

2. Food builds up your body.

3. Food keeps away illness and makes you healthy.

The Foods you need

1. Energy Givers

Quick energy:
When you are feeling tired, a glass of sweet lemon sherbat perks you up at once. Sweet things like sugar,jaggery (gud) and fruits give you quick energy which lasts for a short time: you soon feel hungry again.

Energy for some hours:
Rice, roti, bread, bhakri, potatoes and tapioca give you energy that lastor several hours.

Energy to store:
Butter, oil, ghee and nuts contain fats. Fats are stored in your body. At times when you need extra energy, or when you do not get enough food, fats are used up to give you energy.

2. Body Builders

Milk, eggs, meat, fish, split pulses (dals), sprouted pulses and nuts help to build up and repair your body. They make you strong.

3. Disease Fighters

Some foods keep you healthy. They help your body to fight diseases. They also help you pass the stools out of your body.

These disease fighters are, fruits, vegetables, unpolished rice and other cereals with their skin, and fermented foods like curds, idli and dhokla.

Washing food

Fruits, vegetables, grains and meat get dirty. In the dirt, there are tiny living things, called germs, too small for us to see. Some of these germs can make you sick.

Before cooking, wash all food well with clean water.

Cooking food

Cooking makes food tasty, easy to chew, and easy to digest. Heat kills the germs in the food.

Eat some foods raw, like, carrots, tomatoes, onions, radish, lettuce and cucumber. Wash raw foods very well before you eat them! Always eat fresh food.

Growing children like you need a lot of food. The food you eat goes to your stomach. The useful part of this food gets into your blood. Along with the blood, it reaches all parts of your body. This is what gives you energy and makes you grow.

The parts of the food you do not need are thrown out of your body through your stools.

You are made from the food you eat. So eat the right foods!

Water helps to wash away waste in the body. Your body needs about eight glasses of water every day. Drink plenty of water between meals.

Know these words

grains, cereals, pulses, energy, strength, disease, dirt, germs, digest, stools

DID YOU KNOW?

- Do you eat ragi? Of all the cereals we eat, ragi has the best body builders and disease fighters!

teaching ideas

STORY *(1 period, including introduction to Activities)*

I explained the story situation and the difficult words. Although the three food groups are introduced in the story, I did not explain them in detail at this point.

New words in the story:

energy, disease, healthy, fit, lapped

> Mini and Apu's list of food for the kitten was more appropriate for humans. All living things have differing requirements of food. Cats belong to a group of carnivorous animals who are adapted to a high-protein meat or fish diet.

ACTIVITIES

1. Know your grains *(1 period)*

(Common names are given in the Glossary)

I introduced the terms 'grains', 'cereals' and 'pulses' and asked students to bring different cereals and pulses from home. In what they brought, some cereals like corn and barley, and pulses like vaal, chawli, were missing, which I got from my grain shop. Students were not familiar with the names of all the cereals and pulses. They recognised some, for example, "Ragi - my mother gives it to my baby sister." and "Chawli - I have seen it inside ragda pattice!"

I wrote all the names of the cereals and pulses on the blackboard and students copied them. We played a game with two teams in which one student from each team had to identify a cereal or a pulse. The exercise on colours of cereals was done at the same time.

Main Index

I reminded students that in the sprouting activity of Chapter 3 we had noticed a difference between plants of cereals and pulses. The cereal plants were like grass, while the pulse plants had branches and leaves.
List of cereals and pulses used:
Cereals: rice, wheat, ragi, bajra, jowar, corn, barley, oats.

Pulses: toor, moong, masoor, udad, chana (most of these we had in whole as well as in split form, as dal), rajma, chawli, matki, peas, vaal, soyabean.

> Cereals are the seeds of some grasses. They are monocotyledonous seeds, that is, the seed does not split into two parts. Cereals are rich in carbohydrates. We make flour out of cereals and turn them into rotis or porridge. Sometimes they are cooked whole or partially ground.
>
> Pulses are the seeds of some leguminous plants (like peas and beans). They are dicotyledonous seeds, that is, the seed splits into two parts. In farms they are planted alternately or in rotation with with cereal crops since they enrich the soil. Pulses are rich in proteins. We make dals and curries out of them.

2. Visit the Market *(Field-trip)*

(Common names are given in the Glossary on page 230.)
There is a well-stocked vegetable market close to the school. I took the students there, where they wrote the names of fruits and vegetables. I helped them with the spellings. Students did not know the names of many of the vegetables - often they had seen them only in prepared and cooked form. They did not know the different leafy vegetables.

I did not insist on English names for all the vegetables, but accepted common local names like 'bhindi', 'karela' and 'lauki' or 'doodhi'. I also encouraged students to accompany their elders who they went shopping for fruits and vegetables. The '*Name and* ***Draw'*** exercise for fruits and vegetables followed this activity.

List of leafy vegetables made by students:

palak, chawli, methi, ambadi, ambat chuka, alu, mayalu, shepu, spring onion, radish, pudina (mint), coriander, kadipatta.

List of other vegetables made by students:
carrot, tomato, brinjal, cucumber, onion, potato, raw mango, cauliflower, cabbage, tindli, raw banana, shimla mirch, doodhi, tinda, gawar beans, french beans, chawli beans, papdi beans, karela, beetroot, padwal, red pumpkin, white pumpkin, yam, drumsticks, arbi, coconut, garlic, ginger, lime, chillies.

List of fruits made by students:
mango (4 kinds), banana (3 kinds), ber, chikoo, orange, mosumbi, grapes, plum, papaya, watermelon, litchi, apple, jackfruit, coconut.

3. **What you eat** *(Home-work + Exercise session)*
Each student made a list in their workbook. I made a combined list of foods eaten by the whole class:

The things I eat raw: Onion, tomato, carrot, cucumber, radish, cabbage, coconut, dhania, fruits, badam ...

The things I eat cooked: Rice, bhakri, dosai, idli, chicken, meat, potato, palak, laddu, jalebi, ...

After teaching the food groups, I asked students to classify the foods into the three groups. This activity was later reinforced by the exercises: *'What I ate yesterday'* and *'Plan a meal'*.

4. **How much water you drink** *(Home-work)*
I found that most students had recorded only two or three glasses of water. I asked them to re-do the activity, and reminded them to drink about 8 glasses of water every day, especially between meals. The next day I found that they had recorded many more glasses

of water. Perhaps they were drinking water just to be able to write it down in their WorkBook!

I told students that we lose water from our bodies all the time - did they know how? What happens when we feel hot, when we cry, when we have a cold? We lose water through urine, sweat, tears and through our nose.

SUMMARY *(3 periods)*

Why we need food

I told students why we need food and water. The three main fuctions of food as given in the textbook are directly related to the three main food groups.

These three food groups are a simplified version of the conventional food groups, as follows:

1. Carbohydrates and Fats

The label 'Energy Givers' can be understood by students through their direct experience. The sub-categories are:

Quick energy	= Sugars
Energy for some hours	= Starches
Energy to store	= Fats

Our body needs energy for carrying out its normal activities like beating of the heart, circulation of blood, breathing, regulation of body temperature and activities of the glands. In addition, we need energy for doing work, for digesting our food and also for growth and repair of the body.

Most cereals, though predominantly energy givers, also give us proteins. If they are whole grains, that is, if the outer skin is included, then they also give us more vitamins and minerals.

Most fat sources (nuts and oilseeds) contain proteins and some vitamins and minerals. The extracted, refined oil has mostly fats.

2. Proteins

The label "Body Builders" has two meanings. It refers to the function of proteins in *growth and repair*, as well as to their contribution to one's *muscular strength*.

Proteins are a vital part of the nucleus and protoplasm of *every* cell in our body! They form the main constituent of the muscles, as well as of the blood, bones, teeth, skin, nails and hair. All enzymes, hormones and antibodies are made of proteins. Tissues in the body are constantly being broken down and replaced by new ones, so we (particularly growing children, pregnant and nursing mothers and manual workers) need proteins continuously.

Milk, eggs, meat, fish, dals and sprouted pulses (the protein sources) to different extents also give some fats, vitamins, minerals and carbohyrates.

3. Vitamins and Minerals

The foods in this category help us to fight diseases in many different ways:

a. Vitamins and minerals are essential to *all* the processes that go on in our body. The DNA molecule which directs the processes in every cell has phosphorus as an important constituent.

b. Lack of vitamins and minerals leads to many deficiency diseases (like night blindness, beriberi, scurvy, rickets etc.) which students will learn about in later classes.

c. Vitamins and minerals help the body fight infectious diseases.

d. Fruits, vegetables and whole grains also contain fibre which helps us in passing motions. In this way toxins or poisons are removed from our body quickly.

e. Fermented foods encourage the growth of bacteria that naturally live in our intestines and help in our digestion. They protect us against intestinal infections.

f. A number of fruits and vegetables have cancer-fighting properties. Dark green and red/ orange vegetables, onion, garlic, turmeric, ginger, sesame, asafoetida (hing) and mustard help fight cancer.
g. The 'disease fighters' also protect us against conditions like diabetes, heart disease, kidney failure and others.

Many deficiency diseases in India have increased because we have started using refined flours, sugar and oils, and polished rice in our diet. These also cause other problems related to digestion and the heart.

Energy and Strength

These two words mean different things. Carbohydrates give us energy, while proteins give us strength. You can see the difference in meaning from the following sentences:

This baby is playing. He has a lot of *energy*. But he does not have enough *strength* to open this heavy door.

My bullocks have the *strength* to pull this cart. But after working hard for the whole day, they do not have enough *energy* to do it.

Students may not understand such a subtle distinction right away. The matching task in *Play with words* may therefore be a little difficult. But correct usage over the years will develop the idea.

I explained that just as we buy food from the market and store it in the kitchen till we need it, our body stores fats. I had earlier, while reading the story about Mini getting hurt, told students about some kinds of food helping to repair the body. Some of the students pointed out that a *'pehelwan'* is also called a body builder.

Some students thought that we need disease fighters only when we are ill. I explained that we need them all the time, to stop us from falling ill.

Included activity:

I taught this lesson just before the lunch break. Most of the students had their tiffin box with them. After introducing the three food groups, I asked the students to show me from their tiffin boxes some energy givers, body builders and disease fighters.

It turned out that all the students had got energy givers, but very few had disease fighters (fruits or vegetables) and none had body builders. I told them that cereals have some body builders and disease fighters, but not enough. I asked them what more they should eat to complete their diet. We also did the exercise on building up a complete meal.

This lesson had a very good effect on students. Over the next few weeks, I noticed they started getting pulses, fruits and vegetables in their tiffin boxes, and they would tell me, for example, "Teacher, today I have brought a disease fighter - bhindi!"

> This topic has to be handled gently when there are children who cannot afford many kinds of food, or others who may bring fancy food in their tiffin boxes. Do emphasise inexpensive sources of proteins (millets, groundnuts, sprouted pulses ...) and vitamins/ minerals (banana, amla, whole cereals, sugarcane, tamarind, lime, leafy vegetables like drumstick leaves, gram (chana), radish (mooli) etc.). Also tell students of the low food value of junk foods including sweets, toffees, chips and soft drinks which give energy but little else.
>
> One of the least expensive cereals in India, i.e. ragi, is also one of the most nutritious. Ragi contains high quality proteins. Of all cereals, it contains the maximum amount of minerals, including calcium and iron. It is therefore an excellent staple food for children, pregnant women and lactating mothers. Likewise, some cheap and nutritious fruits are banana, amla, karvand, chikoo and papaya.
>
> Fermentation of foods, as in making idli, dhokla and curds, increases the amount of B-vitamins in them. However, the instant mixes, which rely on chemical additives to make the dough rise, do not have this effect.

The natural colours of foods are a good indicator of their nutritive value. Green, red, orange and yellow fruits and vegetables contain vitamins, minerals and other chemicals which help us fight diseases.

The colour of flours shows the amount of bran (the thin outer cover of grains), which contains vitamins and minerals. Whole wheat flour (atta) contains vitamin B-complex, calcium, copper, zinc and chromium, which are lost in making refined flour (maida). Unpolished or semi-polished rice which is pale reddish brown or yellow also contains vitamin B-complex which is lost while polishing it into white rice (however, if the rice is parboiled before polishing, much of the vitamins and minerals are retained). Jaggery (gud) which is yellow contains iron and calcium which is lost when we refine it to make white sugar. The refined products can be stored for longer periods without spoiling (perhaps because pests and microbes too find them less nutritious!).

In summary, refining retains the energy-givers but loses the disease fighters.

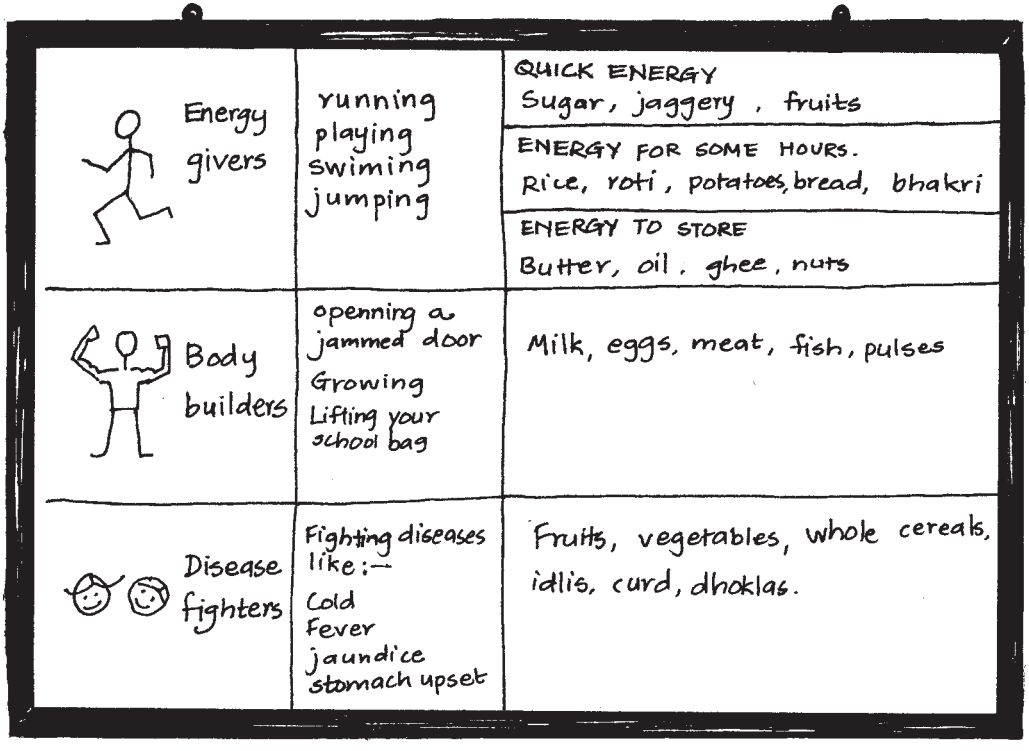
Of course we must not stretch this idea too far to conclude that colour is the sole indicator of food value. Milk and radish are white, yet very nutritious! Also, remember that we are talking about the natural colours of food, and not artificial added colours! If fruits are artificially treated to improve their colour, their nutrient value is less.

Washing food

Students have to learn the importance of washing raw foods. I thought the best way of teaching this was to ask students to get one vegetable or fruit which they could eat raw. They could wash it in school, and the whole class could share and eat whatever they had brought. But it turned out we were running out of time, so I read the text and asked students to do this activity at home.

On the next day, I found that only about six or seven students had done the activity at home. I therefore planned to revise this point in the first activity of the *Measurement* Unit which involves writing a recipe.

BLACKBOARD WORK



Energy givers	running playing swiming jumping	QUICK ENERGY Sugar, jaggery, fruits ENERGY FOR SOME HOURS. Rice, roti, potatoes, bread, bhakri ENERGY TO STORE Butter, oil, ghee, nuts
Body builders	openning a jammed door Growing Lifting your school bag	Milk, eggs, meat, fish, pulses
Disease fighters	Fighting diseases like:— Cold Fever jaundice stomach upset	Fruits, vegetables, whole cereals, idlis, curd, dhoklas.

EXERCISES *(7 periods + home-work)*

Some examples of students' responses are given. Each student should answer these questions from his or her own experience.

Observation-based exercises

Name and Draw

1. Some vegetables of these colours:

a. Green (leafy)
spinach (palak), amaranth (chawli), coriander (dhania), radish leaves (mooli), drumstick leaves, spring onion

b. Green (not leafy)
french beans, gawar and other kinds of beans, lady's finger (bhindi), capsicum (simla mirch)

c. Red or orange
beetroot, carrots, radish, tomatoes, ambadi

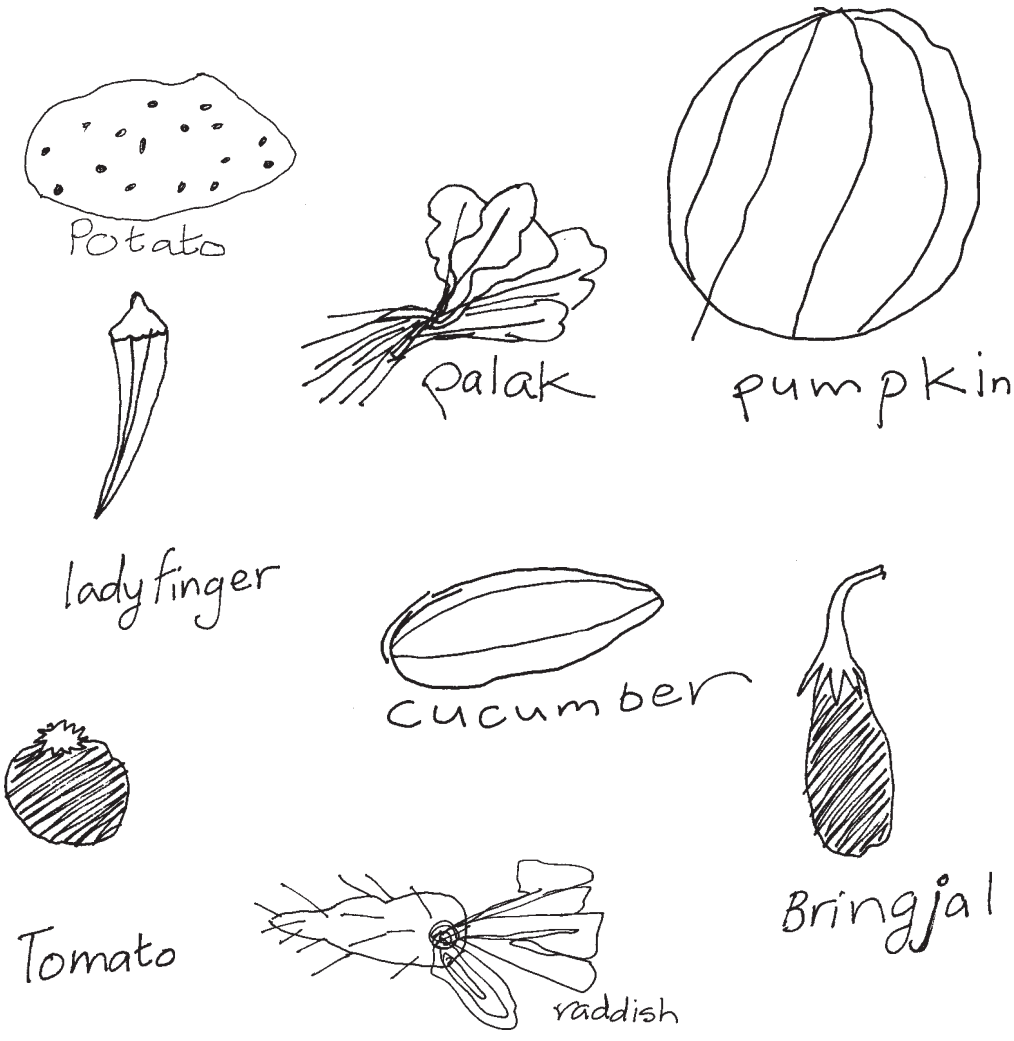
d. Purple
brinjal, onion, purple cabbage

e. Yellow
pumpkin, papaya, jackfruit, yam

f. White
radish, white onion, white pumpkin, garlic, cauliflower, arbi

2. Your five favourite fruits
banana, jamun, ber, amla, orange, chikoo, mango, papaya, grapes

Sample drawings of students: (spellings not corrected)



Short questions

1. Name three of your favourite:

a. Energy-giving foods
upma, dosai, laddu

b. Body-building foods
groundnuts, fish, rajma

c. Disease-fighting foods
Mango, carrot, aloo-methi

2. Name five foods which you like to eat raw and five foods which you like to eat cooked.
(See students' responses in the activities section).

3. Write the names of two cereals and say what foods can be made from each of them.
Some examples are given. Foods would vary according to different regions and cultures.
Rice:
boiled rice, kanji, idli, dosai, khichadi, pulao, kheer, papad; many things made from beaten rice (pova), puffed rice (murmura) and rice noodles (sevai), many kinds of snacks
Wheat:
roti, chapati, stuffed rotis, dalia, upma, kheer, halwa, noodles; many kinds of snacks
Ragi:
roti, thalipeeth, sattu, porridge, papad, snacks
Jowar:
roti, thalipeeth, sattu, tikki, laddoo and other snacks made of puffed grains
Bajra:
roti, thalipeeth, sattu, tikki, laddoo and other snacks made of puffed grains
Corn:
roti, bhutta, porridge, popcorn, cornflakes, soups, cakes, snacks

What's same? What's different?

1. Give two similarities and two differences between:

a. Sugar and Jaggery

Both are made from sugarcane (In some countries, sugar is made from beetroot, dates or sweet-potato. In South India, jaggery is made from the sap of the palmyra palm). Ants like both. Both are sweet and give us quick energy. Sugar is white and grainy, jaggery is yellow and lumpy. Sugar dissolves in water more easily. Jaggery has disease fighters, sugar does not.

b. Bread and Chapati

Both are made from wheat. Both give us energy for some hours. Bread is usually soft and white, chapati is harder and brown with black dots. Bread comes in different shapes - a slice of bread usually square, chapati is flat and round. Chapati is made from whole wheat - that is, atta which is not sieved - and so has more disease fighters, though bread can also be made from whole wheat.

Language development exercises

Talk and Write

1. What I ate yesterday.

(What energy givers, body builders and disease fighters did you eat yesterday?)

Some students' responses:

Energy givers:

chapathi, rice, poha, bread, jam, biscuits, idli, dosai, potato, samosa, pani-puri, papad, tea, sugar, milk, nimbu-pani (lemon sherbat).

Body builders:

milk, dal, fish, badam, chana masala, sambhar.

Disease fighters:

mango, orange, banana, guava, potato, tomato, bhindi, cabbage, brinjal, carrot, beans, nimbu-pani.

I found out that some of the students had a diet deficient in protein and vitamins/ minerals. One girl in the class wrote of her day's diet, "potato, poha, jam, chapati, sugar and milk". I had noticed in class that she looked pale and always came up to my table to copy things from the blackboard. Her eyesight was probably bad. I asked her parents, who appeared quite well-off, to get her eyes checked by a doctor and to make sure she ate green and red vegetables.

2. Plan a meal.

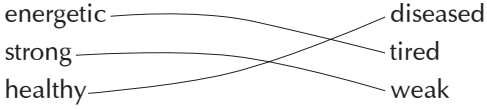
(What would you want to eat for lunch, to give your body what it needs?)

At first students mechanically put together foods they liked, so that they had an energy giver, a body builder and a disease fighter. They made odd combinations like, 'samosa, meat, tomato' and 'juice, paneer, cucumber'. I then asked them questions like, "Will this taste well?", "Will it fill your stomach?" Their later responses were better thought out, for example:

Roti, toor dal, cauliflower.
Rice, fish, beans.
Poori, chhole, radish.
Chapathi, sambhar, mango.

Play with words

1. Match these three words with their opposites:



Students' questions about food:

I initiated this session with some questions of my own, about where our food comes from, and about the variety of foods people in different places eat. Students followed by questions like:

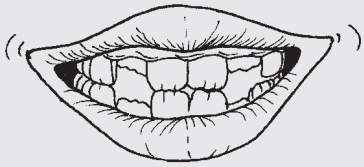
Where did this chapati come from?

The flour was made from wheat which was ground in the mill. Wheat in the grocer's shop comes in trucks from the godown in town. It must have been brought there from a farm... etc.

This class had students from different parts of the State and Country. In the exercise sessions, students had been introduced to eachothers' habits, so they could ask questions like "What do people in Kerala eat?"

What students learnt:

I found out that the three simple food-groups were learnt very well by all the students. They would often talk about them while eating their tiffin boxes. Once, outside the classroom, we saw a crow holding a piece of bread in its beak. At once several of the students called out, “Energy giver!” One student asked, “Crows eat earthworms. Is that because they need body builders?” I was very pleased with all these responses: my students were using in their life what they learnt in the classroom!



CHAPTER 7

Our teeth

ACTIVITIES

Tooth talk

1. What's in your mouth?

Ask your friend to open his or her mouth.
Describe what you see inside.

2. Looking at teeth

a. Look at your teeth in the mirror. As soon as you have eaten something, look at your teeth again. Feel them with your tongue. Do they look and feel different?

b. If your tooth falls out, or if someone in your family has a tooth fallen out, take it. Wash it well with soap, and bring it to school.
Draw a picture of this tooth.

3. Talking with teeth

त थ द ध न

Say these letters. Which part of your mouth did your tongue touch?

Check this out!

Do your teeth hurt when you eat or drink something very cold, very hot, or very sour?
If they do, you may have holes in your teeth! Tell your parents and see a dentist (tooth doctor).

Main Index

SUMMARY

Remember this

Teeth chew your food. They help you to speak. Gums hold the teeth in your mouth.

Babies' teeth are called milk teeth. They fall out after a few years. New, bigger and stronger teeth take their place.

Take care of your new teeth. If they fall out, you will have no more teeth.

These foods help to build strong teeth and bones:
milk and things made out of milk,
drumstick leaves, spinach and other green leafy vegetables,
fish, ragi, pulses like rajma and chana,
nuts and seeds like onva (ajwain), sesame (til) and cumin (jeera).

Chew carrots, turnips, radish and guavas. They exercise your gums.

Avoid toffees and chocolates. Sweet and sticky foods are bad for your teeth.

How teeth get dirty:
Bits of food you eat,
Are stuck between your teeth.
They will rot,
They will smell,
They will make you feel unwell.

Food sticks between your teeth. If you let it stay there, it becomes food for tiny living germs. Your mouth smells bad. The germs make holes in your teeth. Your teeth become yellow and black. Your gums get swollen. You get toothaches.

So keep your teeth and gums clean!
Massage your gums every day to make them strong.

Wash your mouth after eating or drinking:
Rinse your mouth with water.
Rub teeth and gums well.
Rinse your mouth again.

Brush your teeth every morning and evening:
Use a twig of neem or babool,
toothpowder,
or toothbrush and toothpaste.

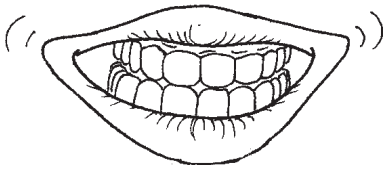
Brush up, brush down,
Brush inside and out.
On the right, on the left,
Brush every tooth well.

Know these words

rot, rinse, massage

DID YOU KNOW?

- You were born with *two* sets of teeth hidden inside your gums. One set of teeth grew, and came out your gums. These were your milk teeth.
- Now the other set of teeth are growing, and pushing the milk teeth out one by one!
- The hardest part of your body is the outer cover of your teeth.
- If your skin, muscles or bones are hurt, your body can repair them. But the body cannot repair a broken tooth.



teaching ideas

ACTIVITIES

1. What's in your mouth? *(1 period)*

Students described the tongue, and the teeth in the upper and lower jaws. They noticed the teeth were fixed in the gums, and that they had different shapes. The teeth at the back of the mouth were larger, with four points. They noticed the flat and the pointed teeth, but I did not introduce the words for different kinds of teeth.

2. Looking at teeth *(Home-work)*

I found that many students enjoyed opening their mouth and examining it in the mirror. They did this activity at home. I also had a mirror with me, in case some had forgotten to do it. Students noticed that after a meal there was food stuck between their teeth.

The activity of bringing a tooth to school and drawing it could not be done during the Unit, but later in the year some students brought their fallen teeth. One student brought his grandmother's old dentures, which the other students observed.

3. Talking with teeth *(1 period)*

I wrote the Devanagari alphabet on the blackboard. I asked students to recite one line at a time, and say which parts of the mouth they were using. They easily realised for which sounds the tongue touches the teeth (tha, ttha, dha, ddha, na). They also identified la, va, sa, tra as sounds which need the use of teeth.

क ख ग घ ङ	*throat*
च छ ज झ ञ	*front of palate*
ट ठ ड ढ ण	*top of palate*
त थ द ध न	*teeth*
प फ ब भ म	*lips*
य र ल व श	
ष स ह ळ क्ष	
ज्ञ	

Main Index

Check this out!
One student in the class said that she did not like cold and sour things because they made her teeth hurt. I spoke to her parents to get her teeth checked.

SUMMARY *(2 periods including some Exercises)*

The foods listed as those which 'help to build strong teeth and bones', are foods with a high calcium content. Generally, foods high in calcium are also high in phosphorous. In addition to calcium and phosphorous, teeth and bones also need vitamin D, which we get from sunlight.

Students described how they brushed their teeth. There were some jokes as one child said her brother likes to eat toothpaste. I told them that eating toothpaste was harmful. Rubbing (massaging) of gums and teeth while washing the mouth is a good practice which stimulates blood circulation to the gums.

Summary of classroom talk:
How I brush my teeth
I brush my teeth when I wake up in the morning.
I brush my teeth before I go to bed.
First I wash my brush.
I put paste on the brush.
I rinse my mouth with water.
I brush my upper and lower teeth.
I brush in the front, on the left and right, inside and outside. I brush up and down.
I rub my gums in the front, on the left and right, inside and outside. I rinse my mouth with water many times.

EXERCISES *(3 periods)*

Observation-based exercises

Short questions

1. Which of these things are good for your teeth and which are bad for them?

a. Eating carrots, drumstick leaves and ragi (good)
b. Washing your mouth after drinking milk (good)
c. Eating sticky sweets (bad)
d. Rubbing your gums while washing your mouth (good)
e. Not brushing your teeth (bad)

2. What hard foods do you like to chew with your teeth?

carrots, sugarcane, apples, til laddu ...

3. What foods can you eat without using your teeth?

mashed rice or other foods, porridge, sattu ...

Language development exercises

Talk and write

1. How my tooth fell out.

(Did you know that the tooth was going to fall out? How did you know? When did the tooth fall out, what did you do then? How many of your teeth have fallen out so far?)

Sample essay (not corrected):

How my tooth fell out

One day I am jumping in the garden and my teeth fell down on the mud of the garden.
My four teeth have fallen.
First my tooth became loose. I could shake it with my tongue.
It pained when I ate something hard.
One day my tooth fell out.

2. My new teeth.

(Look at your new teeth in a mirror. How many new teeth do you have? Are they smaller than your milk teeth or bigger? What do you do to take care of your teeth?)

Sample essay (not corrected):

My new teeth

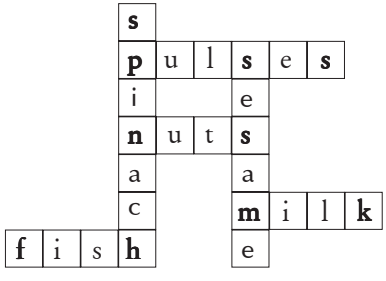
I had 20 teeth.
I lost teeth, and I have new teeth.
When we lost our teeth we bury in the mud and our new teeth grows.
When my new teeth grows I have bad hurt.
When my new teeth grows, it is very strong.
My new teeth is very white.
My new teeth biggest in my mouth.

Play with words

1. Complete these pairs of words to say how you should brush your teeth:

a. Up	and	Down
b. Inside	and	Outside
c. On the Right	and on the	Left

2. Fill the squares with names of foods that give you strong teeth:



Ask and find out

1. **Ask your grandfather or grandmother if they have lost their teeth. Do they use false teeth? Can they eat hard food? Can they talk without their teeth?**

2. **If there is a baby in your house or nearby, find out how old it was when it got its first tooth. How many teeth does it have now? Find out what it eats and drinks, whether it can eat hard food like sugercane, apples and groundnuts.**
   Students talked enthusiastically about their grandparents and babies in their houses. Most of them felt that their grandparents could talk quite well even without their teeth, though they could not eat hard food. Some of them had counted the teeth of their younger brothers and sisters.

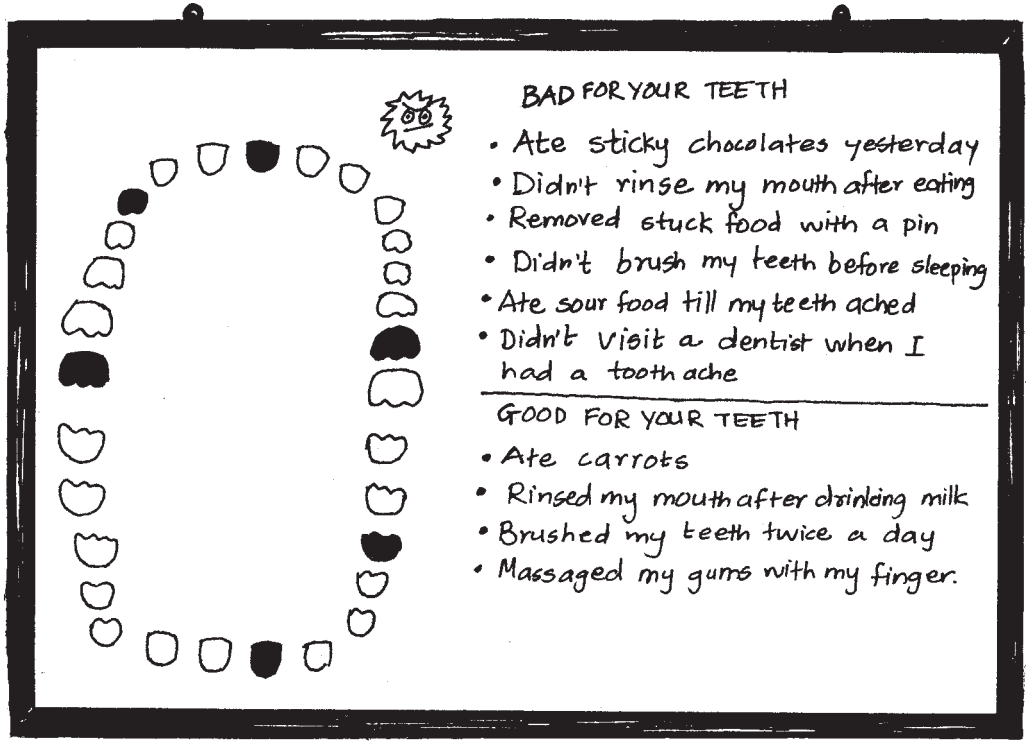
Students' questions:

Why do teeth break?
Teeth are made from 'calcium' that we get from green vegetables, milk, pulses, etc.. If we do not get enough of the right foods, the teeth are weak and break easily. If we do not brush our teeth regularly, germs grow around them. Germs make 'acid' which breaks the teeth. Sometimes however, your teeth might be weak because your parents have weak teeth.

What is a cavity?
'Cavity' means a hole. Holes in our teeth can be made for the same reason as above. Notice teeth which are broken or have a cavity. They also look discoloured.

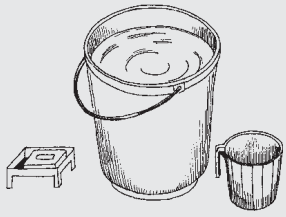
Are milk teeth made out of milk?
In a sense, yes, because milk does help to build up our teeth! For babies milk is the main food in the first few months.

BLACKBOARD WORK



Blackboard game on care of teeth:

Draw the set of teeth on the blackboard with a cartoon depicting a germ. Give the students examples of actions and ask if they are good or bad for their teeth. Write these statements, as shown, on the appropriate portion of the blackboard. For every action that is bad, erase one of the teeth.



CHAPTER 8

Taking care of our body

STORY

Apu's bath

Apu was in the bathroom, but there was no sound from inside. Mini banged on the door. Apu! Hurry up with your bath, or we will be late for school!"

"I'm hurrying! I'm hurrying!" called Apu.

"What are you doing inside?" Mini demanded.

"I'm washing my legs, and scrubbing between my toes."

"And now?"

"My arms, and between my fingers!" Apu was really enjoying himself.

Wash that dirt,
Wash that sweat.
Scrub the body,
Scrub the head!

Behind the ears,
Around the neck,
In folds of skin,
That's where you check!

Between the fingers,
Between the toes,
Under arms and legs,
Around the nose!

Main Index

"Apu?"

"I'm sliding on the floor! And look at this big bubble I made!"

"Apu, it is seven o'clock already!"

"Okay, okay! My face now ... Owww! I don't like this."

"Poor Apu," thought Mini. "He's got soap in his eyes again!"

There was sound of water being poured hurriedly. Apu rushed out, wiping his face. "Mini, why do *I* always get the soap in my eyes and water in my nose?"
"Close your eyes, and take a deep breath just *before* you splash water on your face." Mini told him. "Let's go swimming today, then I will show you!"

Apu jumped with joy. "Playing in water is such fun!"

ACTIVITIES

A healthy, happy body

1. Clean and bright

Ask these questions to yourself and to two of your friends:
a. Did you brush your teeth today?
b. Did you have a bath?
c. Did you comb your hair?
d. Are your hands clean?
e. Are your nails cut and clean?

2. Daily routine

Write down the activities that you do every day, from the time you wake up, till you go to sleep. Your list should include the activities written below. Remember that you do some of these things more than once in the whole day:

Have a bath
Wash your hands and feet
Brush your teeth
Eat food
Pass stools
Comb your hair
Wash your mouth

Check this out!
Check your list of activities for these things:
a. Do you brush your teeth at least *two times* in the day - once after waking up, and once before going to bed?
b. Do you wash your mouth *every time* after eating food?
c. Do you wash your hands and feet after passing stools, and after coming home from outdoors?
If your answer to any of these questions is "No", write down the activities again, in the order in which you should do them.

3. How strong are you?
This game is called 'Arm wrestling'. Play it with your friend. Who is stronger?

4. Exercise your body
a. Walk like a duck. Jump like a frog. Run like a four-legged animal.
b. Each of you show one exercise to the class. The whole class can do the exercises.

SUMMARY

Remember this

Eat the right kinds of food
Eat energy givers, body builders and disease fighters. Drink plenty of water.

Keep clean

Every day

Brush your teeth

Pass stools:

Use a sanitary latrine.

If there is no latrine, pass stools in a place far away from wells, rivers or other drinking water. Cover the stools with mud.

After passing stools, wash yourself. Then wash your hands well with soap or ash. Wash your feet.

Have a bath:

Dirt sticks in *folds* of skin. Wash the places on your body where your skin is folded. Wash between your fingers and toes.

After coming home from outside, wash your hands and feet.

Wash your hair one or more times every week.

Comb your hair:

Use a clean comb. Check your hair for lice. If you have lice, take the help of an older person. Use a medicine to remove the lice.

Keep your nails short and clean:

Dirt and germs from your nails can get in your food, and make you sick.

Cut your nails every few days. Take help from an elder person to trim or cut your nails. Never bite your nails.

Exercise well

Running and playing is fun, and it keeps you fit!

Take enough rest

At the end of the day, you are tired and need to rest. You need to sleep for about nine hours in the day.

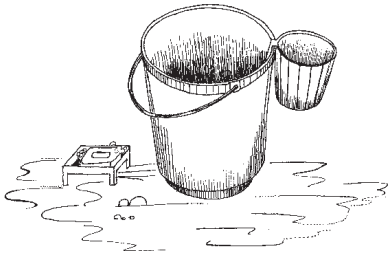
Know these words

sanitary latrine

dirt, sweat

DID YOU KNOW?

• The tiny green or gray balls that you see every morning in the inside corner of your eyes, are made of dirt and dead germs. The watery tears in your eyes kill many germs and wash out the dirt to one corner of your eye. Remove this dirt with clean, cool water.



teaching ideas

STORY *(1 period)*

The story situation and the words are quite simple. I read out the text and rhyme with the students doing the actions.

New words in the story

scrub, scrubbing, hurriedly

ACTIVITIES

1. Clean and bright *(1/2 period)*

In the previous weeks, I had been carrying out a periodic inspection of the students' cleanliness. So it turned out that many of them could honestly answer "Yes" to all the questions in Activity 1. They filled the Table in the WorkBook by consulting with two of their classmates sitting near them.

2. Daily routine *(1 1/2 period)*

The majority of the students in the class lived in a hostel, so they had a common daily routine. This is the routine that I discussed in the class. I asked students to first read the list of seven activities in the book carefully. They had to include these activities in their list. Whenever they forgot to do so, I reminded them. The order of activities given by students during this group discussion was as follows:

Wake up → pass stools → wash hands and feet → brush teeth → have a bath → wipe the body → wear clean clothes → Comb hair → pray → work in the hostel

Main Index

(bring chairs, sweep the room, clean the verandah) → wash hands and feet → breakfast → wash mouth → go to school → pray → study → play in the recess → study → play → go back to the hostel → wash hands and feet → change clothes → food → wash mouth → wash the plates → karate - tuition → work in the hostel (remove garbage, chop vegetables) → play (cricket, carrom, kabaddi, kho-kho) → wash hands and feet → food → wash mouth → watch T.V/ play/ study → go to sleep.

This is a somewhat difficult task. The written responses of students normally contain much fewer activities than come out in a group discussion. Even a few activities are fine, as long as students get the sequence right. The task of putting their actions in a sequence also links up to the concept of 'time' which is introduced in the next Unit.

Make sure that students write down the actual order in which they do things, and not copy down a standard answer. The final order would differ from student to student. Check the answers for the points mentioned: brushing teeth after waking and before sleeping, washing hands and feet after passing stools or after coming from outdoors, and washing mouth after eating food.

3. How strong are you? *&* **4. Exercise your body** *(1 period)*

The body exercises were done outdoors. Most students enjoyed showing exercises and doing them. Some shy students also finally participated.

SUMMARY *(2 periods)*

I revised the importance of eating all the three kinds of food and drinking water. Most of the explanation was concerned with keeping the body clean.

Answering nature's calls:
Talking about one's personal toilet habits is often a source of emabarassment for students. Teachers are also reluctant to discuss these matters in class, because of the sniggering and laughter that they are afraid it might cause. As a result, many students read the terms, 'urine', 'stools', 'bowel movements', 'faeces' or 'defecating', but have absolutely no idea what they mean! Incredibly, they learn facts like 'urine is a pale yellow liquid', without realising that this has anything to do with their daily habits.

Such a situation can be avoided by finding out the common words used by students for urinating and passing stools. These are usually either euphemisms, like 'going out', or baby words, like, 'pee / poo' or 'shee / soo'. Please do use these words in your classroom explanation. If you do this in a matter-of-fact way, students will not feel shy to talk about these things.

Students pointed out the folds of skin, where dirt sticks. Then I asked them to tell me when and how they had a bath. One by one they gave the steps in one sentence each. I wrote down the sentences in that order on the blackboard, correcting grammar and vocabulary as I went along. Sometimes students said things in the wrong order, which I pointed out so they could correct it themselves.

Some children had different ways of doing things. Some used coconut oil while having a bath. Some used shikakai or other herbs, others used soap or shampoo to wash their hair. In different regions, with different children, and depending on the water sources in the locality, there would be some differences in ways of having a bath and ways of brushing teeth. These differences are normal, but we should make sure that the essential steps are not missed.

Summary of classroom talk:
How I have a bath
I take a bath in the morning.

I remove my clothes.
I put coconut oil on my head.
I put water on my head.
I put soap on my head.
I scrub it well.
I put soap on my body.
I scrub everywhere.
I scrub in folds of my skin.
I put water on my head and body.
All the soap is washed out.
I wipe my body.
Now I am clean!

EXERCISES *(4 periods + home-work)*

Observation-based exercises

Name and draw

1. The things that you need:

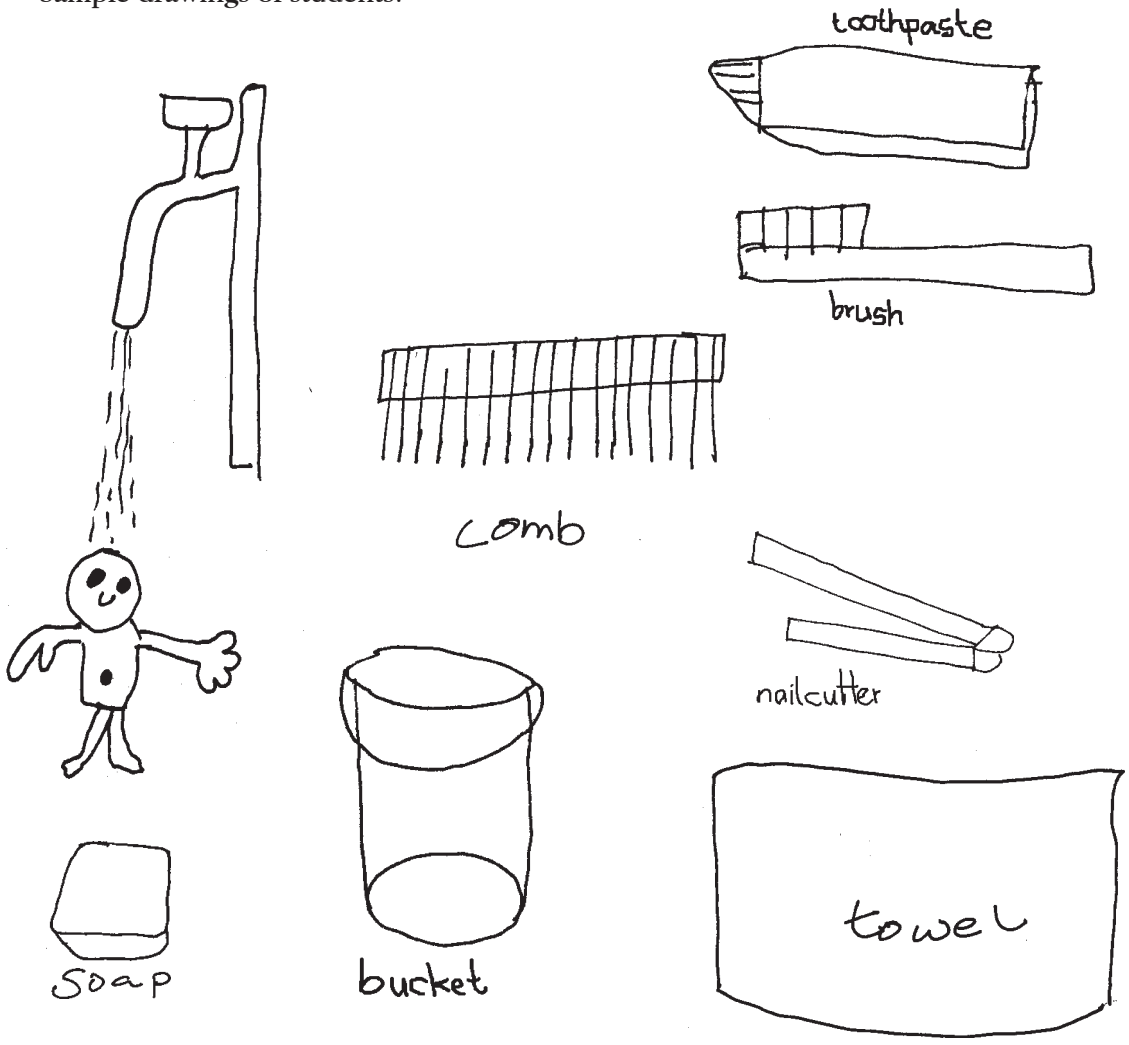
a. to take a bath
water, bucket/ mug/ pot/ hundi/ lota, soap, towel

b. to keep your teeth clean
brush/ datun, toothbrush, toothpaste, toothpowder

c. to keep your hair clean
comb, fine-tooth comb, oil, shikakai, soap, shampoo

d. to cut your nails
Students drew scissors, nail-cutters and razor-blades. Although the last of these is dangerous, it is a cheap alternative used by many people. Razor blades should be used only by adults.

Sample drawings of students:



Short questions

1. Which of these things are good for you and which are bad?

a. Growing your nails long	(bad)
b. Eating fruits every day	(good)
c. Getting up late every morning	(bad)
d. Sitting or lying down all day	(bad)
e. Running and playing	(good)
f. Sleeping for only four hours in the night	(bad)
g. Washing your hands before eating food	(good)
h. Putting sharp things in your teeth, ears and nose	(bad)
i. Brushing your teeth twice every day	(good)

2. Name the parts of your body where the skin is folded.

(You need to wash these parts very well.)

Near all the moving joints, we find the skin folded. Places where dirt tends to stick are, insides of elbows and knees, around the neck, under arms and between the legs. Since children play in the mud, the spaces between fingers and toes should be watched. This is where skin diseases like scabies often start.

What's same? What's different?

1. Give two similarities and two differences between:

a. Teeth and Nails

Both are hard, sharp, white parts of your body; we use them as tools for cutting and tearing; both grow only at the root; nails grow throughout the life, but teeth only during childhood; teeth get cavities, nails do not.

b. Comb and Toothbrush

Both are used for cleaning parts of the body; their teeth/ bristles are similar; toothbrush is

usually used with toothpaste, comb with hair-oil; you need water to brush teeth but not to comb hair.

2. Find the odd one out:

a. soap, water, *dirt*, towel (things to keep us clean)

b. langdi, *playing cards*, kho-kho, kabaddi (active games)

Language development exercises

Talk and write

1. The games I play.

(Write down the names of the games you play. Guess which of these games give you a lot of exercise.)

2. What illnesses I have had.

(Have you had a fever? Cough? Cold? Stomach upset? Chicken pox? Anything else?)

3. When I fell ill.

(How did you know you were ill? What felt wrong? Did you have to take medicine? Did you have to take rest? Did you eat as usual or did you take special food? Did you see a doctor? What did the doctor do?)

Sample essay:

When I fell ill

I got a fever.
My body was hot.
My mother put wet cloth on my forehead.
I went to the doctor.
The doctor checked me with a stethoscope.
The doctor gave me injection.
Then I cried.

The doctor gave me medicine.
Then I went home.
I became alright.

Ask and find out

When you were a baby, the doctor must have given you some injections and some medicines, to help you fight against diseases. Find out if you have had these injections.
Students should know that when a baby is born it has to be given injections to help it fight diseases. They would not know the names of these diseases.

> The immunisation schedule for newborn babies is very important to follow. It is available with all doctors, and at Primary Health Centres. The BCG injection is given at birth, while doses of the triple antigen injection (for diphtheria, whooping cough, tetanus) and oral polio start at 2 or 3 months of age, continuing till the age of three or five years. Periodic immunisation is also given for tetanus toxoid, cholera, typhoid, hepatitis B (jaundice), measles, mumps etc.. Smallpox vaccination is often not given these days as the disease is almost certainly eradicated.

Student's questions:
Why is there often dirt in our nose? How can we take it out?
You notice you have more of this dirt after you have been to a smoky, polluted place. The wet mucus and hair in your nose trap the dust and dirt in air and do not let it enter the lungs. Very tiny hair-like 'cilia', which are on the inside of the nose and other parts of the air passage, sweep the mucus, with the dirt, away from the lungs and back into your nose or mouth. When you have a bath, this dirt is loosened by the steam and water which enter your nose. At this time, it is easy to blow the dirt out of your nose.

SUPPLEMENTARY EXERCISES

Observation-based exercises

Riddles/ Short questions

1. It covers our body.
2. It is red and flows through our body in tubes.
3. They help us to move.
4. They are the hard parts of the body.
5. We have joints in our ___ , ___, ___ , ...
6. Are there some foods which are good for you but you do not like to eat them? What are they?
7. Are there some foods which you have seen but never eaten? What are they?
8. Do other animals take a bath? Have you watched a sparrow take a water bath or a dust bath?

What's same? What's different?

1. Give two similarities and two differences between:

a. Any two kinds of fruits
b. Any two kinds of vegetables
c. Any two kinds of grains
d. Any two kinds of games

2. Find the odd one out:

a. nuts, spinach, guava, chocolate
b. brushing teeth, biting nails, having a bath, combing hair
c. swimming, running, snakes and ladders, wrestling

Language development exercises

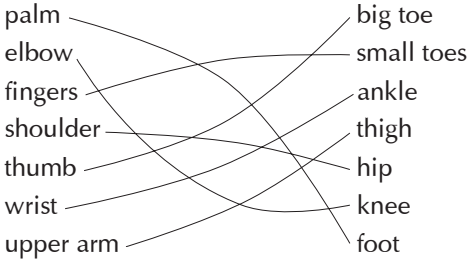
Talk and write

1. Five lines on:

a. Things that are good for me and things that are bad
b. Things that my mother tells me not to do, and why

Play with words

1. Match these parts of the arm with parts of the leg:

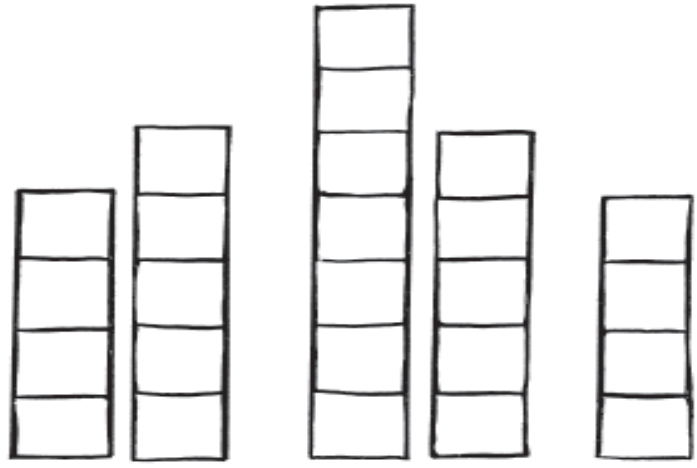


2. Write the names of some foods. Then jumble the letters of each name and tell it to your friend/ teacher. Your friend and other students will try to guess the name. For example, for 'turnip' you can say 'pitrun' and ask the others to guess.

Ask and find out

1. Find out the different things that people use to clean their teeth.
(Tell students that tobacco and lime are used sometimes, but they are actually harmful to the teeth and gums.)

2. In what different ways do people take a bath?



UNIT 3

MEASUREMENT

Main Index

UNIT 3 Measurement

AN OVERVIEW

Objectives

To provide students with simple experiences that will help in the development of measurement concepts.

3.1 Get an *intuitive* notion of the following quantities: Number, length, weight, volume, time, temperature.

3.2 Compare two objects or quantities (in terms like, more/less, large/small, heavy/light, tall/short, wide/narrow, warm/cool etc.).

3.3 Order objects or quantites by magnitude, in ascending or descending order (seriation).

3.4 Measure quantities using everyday, non-standard units. Standard metric measurement is NOT expected.

What is new in this Unit

Measurement and quantitative thinking are at the heart of science. Yet, these concepts often remain weak throughout the school years and even in later life. This situation might be remedied if simple, concrete experiences of measurement are provided in the early years. In Class III, we get the students to practice measurement and estimation through everyday activities.

The activities stress estimation and informal techniques of comparison. Students have to use their problem-solving abilities when presented with novel tasks. Thus they get an intuitive feel for the problem of measurement, long before they are introduced to the techniques that will make such problems quite simple. Our aim is to start a process of quantitative thinking in the early years, when it can be done without getting lost in technicalities.

Accurate measurements need skills of reading scales and using decimal notation, which we will teach in Class V. At that stage, standard metric units (starting with centimeters, millimeters,

Main Index

etc. for length) will be introduced. Some questions on weight, temperature and distances are however included in Class III, which do need reference to some standard units like kilogram, kilometer/ mile), and degrees (for temperature). These terms are to be used very informally, just as they are in daily conversation.

Time-table

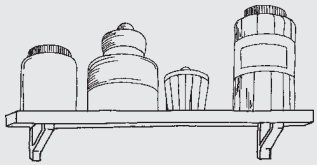
P: Number of periods

Chapter 9

P1	- Story
P2-P12	- Activities, Exercises
P13-P20	- Exercises

Chapter 10

P21-P33	- Activities
P34-P37	- Exercises



CHAPTER 9 How many, how much?

STORY

Cooking surprise

"Apu!" called out Mini, "Dada and Amma are not home yet, and I am very hungry!"
"Let's see what there is to eat in the kitchen," said Apu.

They went into the kitchen and looked around. Some curry and cooked vegetables were kept in covered pots. But there was no sign of roti or rice.

"We will give them a nice surprise!" said Mini, "Let's make some rotis!"

"Okay. Amma does not let us light the stove on our own, but I can shape some nice round rotis." Apu jumped in excitement.

"What do we need to make rotis?" asked Apu.

"It's easy!" said Mini, "We need flour, and salt and water!"

Mini quickly got down the box of flour from the shelf. Apu ran and got a mug full of water, and the jar of salt. "Wash your hands, Mini," he called out, "we are the cooks today!"

"We'll mix some flour with salt. Now let's put the water." said Mini.

"I love to mix it!", said Apu, putting his hands in happily.

"Apu, look what has happened!" cried Mini, "this looks like a soup. How can we shape it into rotis?"

"It is a very salty soup!" replied Apu, tasting some doubtfully.

Just then, Dada walked in. "Mini, Apu! What is going on here?"

"Well, we thought of making rotis ..." began Apu.
"... but now we have this soup!" said Mini.

Main Index

"Ah! That's interesting. How did you make it?" asked Dada.

"We put in
one cup of wheat flour," said Mini, "then
half a spoon of salt."

"That's a bit too much salt", remarked Dada. "And how much water?"

"Well, we just poured it in." said Apu, looking unhappy.

Dada patted him. "Don't worry Apu, we will make something delicious out of this mess. We will put in it,

one cup of rice flour,
half a cup of chana flour,
two chillies,
one onion,
a half spoon of powdered turmeric (haldi), and
two spoons of powdered cumin (jeera).

Mini and Apu got to work, washing, then chopping and mixing it all together. Dada heated the tava, put some oil on it, and they poured some of the mixture. Soon the kitchen was filled with the delicious aroma of spicy dosas!

ACTIVITIES

Measures for everything!

1. Write a Recipe

Find out how to make some food that you like. This is a recipe. Write down your recipe. Make a recipe book for the class.

2. Look for Numbers

Look for numbers around you. Look for all the numbers you can find in this book. What does each number mean? Look for numbers written in your school, on buildings, doors, shops, buses, roads, coins, clocks and calendars. Even on your shoes or chappals you might find a number.

Think! Think!

Why are all these numbers there? What are the things they tell us?

3. How heavy is it?

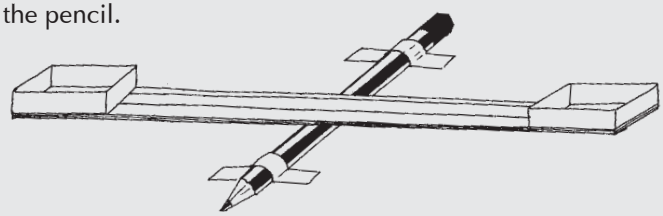
a. Hold your school bag in one hand, and your friend's school bag in the other. Say which one is heavier.

In what other ways can you find out which bag is heavier?

b. You use a balance to *weigh* things, that is, to find out how *heavy* they are.

You will need: a foot-ruler or flat strip of wood, one full and one empty matchbox, a pencil and sticky tape.

Keep aside the matches from the full matchbox.
Remove the trays from both matchboxes.
Make two small loops of stick tape with the sticky side outside.
Fix the loops to the underside of the matchbox trays.
Fix the trays on the two ends of the ruler.
Using sticky tape, fix the pencil on a flat table.
Carefully balance the ruler on the pencil.
This is your Balance.

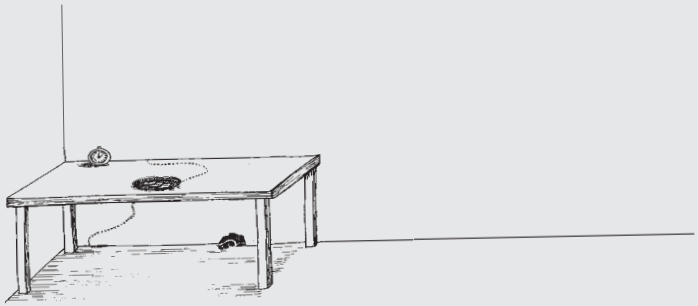


c. Weigh things with your balance
Carefully, without touching the ruler, put a matchstick in one tray of your balance. What happens? Now put a matchstick in the other tray. What happens?

Put three matchsticks in the first tray. Now put matchsticks one by one in the second tray. How many matchsticks do you need in the second tray to keep the ruler balanced?

Instead of matchsticks, try using peanuts, chana or other seeds.

d. Try different small things in the tray, like, a coin, a button or an eraser. See how many matchsticks or seeds you need in the other tray to keep the ruler balanced. Make a table like this:



Put 20 grains of rice in one tray of the balance. See how many grains of puffed rice you need in the other tray to balance them.

4. How much water does the bucket hold?
Get an empty bucket and two mugs. One mug should hold more water than the other. Fill the smaller mug to the brim with water. Pour this water into the bucket. Now stop and think:

a. How many mugs of water will fill the bucket?

b. If I use the bigger mug, how many mugs of water will fill the bucket?

Find out if your guesses were right. Pour in mugs full of water, until the bucket is full.

5. Which jar is bigger?

a. Jar parade

Get five or six jars and bottles of different shapes and sizes. Arrange the jars and bottles from the tallest to the shortest.

Draw pictures of your jars from tallest to shortest.

b. Guess the level

Now get some water in a bucket, and an empty cup from which you can pour water easily. Fill the cup with water.

In each jar or bottle, you are going to pour a cupful of water. But before pouring the water, you have to *guess* what the level of water is going to be.

Mark your guess on the jar with a piece of chalk, and then pour the water.

Guess what the level will be when you pour the next cupful of water. Now see if your guess was right.

c. Think and do!

Find out which jar or bottle holds the most water, and which holds the least.

Now arrange the jars and bottles, in a line, from the one which holds the most water, to the one which holds the least. Draw a picture of the jars arranged like this.

6. Musical beat

Sing a song or say a rhyming poem. Clap to the beat of the song or the poem.

7. Tick-tick counting

Choose 10 students in the class. Give the first student a duster or some other small thing.

Let one student stand at the front of the class. This student is the 'Timer'.

As soon at the teacher says, "start":
Pass the duster from one student to the next, until it reaches the tenth student.
At the same time, the 'Timer' starts counting "tick-tick one", "tick-tick two", "tick-tick three" ....
The Timer stops counting as soon as the duster reaches the last student.

How many 'tick-tick numbers' did it take for the duster to reach the last student?

With another set of ten students, will it take the same 'tick-tick numbers' to pass the duster?

Use the 'tick-tick number' trick to see how long your friend takes to say a tongue-twister, read a poem, write a sentence, drink a cup of milk, climb a staircase, or do any other activity you can think of.

SUMMARY

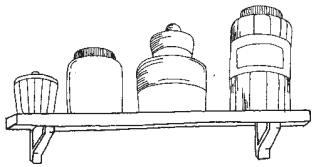
Know these words

weigh, weight, balance, equal

year, month, week, hour, minute, second

DID YOU KNOW?

- An Indian elephant weighs as much as about 180 children like you.



teaching ideas

STORY *(1 period)*

Cooking is a simple, informal context to introduce the need for measurement. Most of the students in the class had watched while their mothers or others cooked. Some of them, particularly the girls, had experience of helping in the kitchen. Some had even made dough for rotis.

Those who had helped in cooking knew that the amounts of rice or flour are measured with a cup, according to the number of people who are to eat. For making dough, water is to be added to flour till the consistency is right: thus there is no measure for the water, only estimation.

New words in the story

excitement, doubtfully, remarked, delicious, flour, turmeric, cumin

ACTIVITIES

Materials to collect

Every student should collect about 7-8 empty matchboxes, to be used for the activities of Units 3 and 4. It is best to start collecting these matchboxes early, perhaps from the beginning of the school year.

The volume activities require clear empty jars and bottles of different shapes and sizes (at least one jar or bottle per student).

Hints for doing the activities

1. Write a Recipe *(Home-work + 1 period discussion)*

I asked students to find out from older persons at home how to make some eatable or drink. This could be something they were able to make on their own, or things which they liked, but

Main Index

could not make. Some of them at first omitted to ask about the quantities. I wrote out some of their recipes on the board, so they got an idea of what was expected. I reminded them to write the actions in the sequence that they were to be done, and to include instructions about washing and chopping of vegetables. I also helped them where they did not have any idea about ingredients or quantities. Where cooking was involved, I asked them to include the time for cooking.

Most students wrote recipes for very simple things like juice, tea, rice and sandwiches. Others got more complex recipes from home. They wrote and illustrated the recipes on notebook sized sheets of paper. I collected their sheets and stapled them, with a cover, to make their recipe book, which we put up on display.

Student's recipe (corrected):

Lemon sherbat

What you need:

one small lemon
two spoons sugar
two pinches of salt
two glasses of clean water

What to do:

Wash the lemon. Cut it in half. Squeeze out the juice in a vessel. Add the salt, sugar and water. Stir it well. Pour into glasses.

2. **Look for Numbers** *(Home-work + 1 period discussion)*

This activity is easier to do with town or city students. In rural areas, there are fewer possibilities for finding written numbers. I suggested to students different places where they could find numbers:

a. In the house (Some of them thought of various gadgets - fan regulators, radio, TV, etc., on doors, newspapers, magazines, shoes, clothes, calendars, watches, light-bulbs ...)

b. Outside the house, (On doors, buildings - for example, house numbers, or numbers marked by the census survey, roads - speed signs ...)

c. On shop signs, prices, weights and volumes on things you buy.

d. On bus stops, railway stations, on outside & inside of buses and trains, on badges of porters. In each of these, I asked the students what the number means, why it is there, and how it helps us. Some of the numbers were for quantity 'how much' (milk, packaged food), some for size 'how big' (shoes, readymade clothes), speed 'how fast' (fan regulator, mixer), 'how loud' (volume regulator on transistor radio), 'how many', where numbers are used for counting and also as a marker or label (number of buses at the depot, or in the State, address numbers, census numbers, etc.) and time (calendar, watch, dates on packaged products).

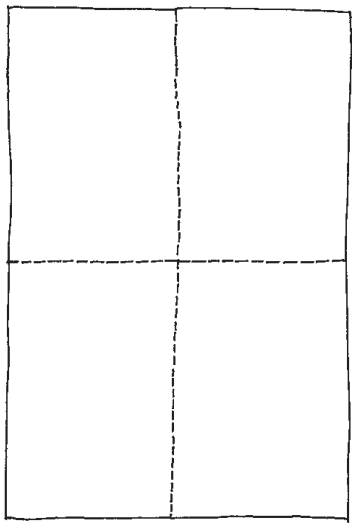
3. **How heavy is it?** *(3 periods including some Exercises)*

a. Students made a guess with theirs and their partner's school bag. Although the two partners often agreed, sometimes they could not judge the relative weights. Some students suggested using a balance, which they had seen, though they were not sure how to go about the weighing.

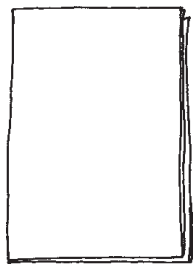
b. Make a balance:

On the previous day I had asked students to get the required materials to class. Many students did not have a foot-ruler and so used a smaller, 15 cm ruler which worked quite well. A few did the experiment with a notebook balanced on a pencil, although this was not as successful. Pencils with a hexagonal cross-section worked better than smooth round ones. Some students who did not have matchboxes made their trays out of two sheets of paper of the same size.

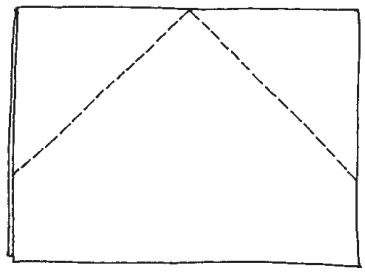
The procedure for making the trays is shown on the next two pages.



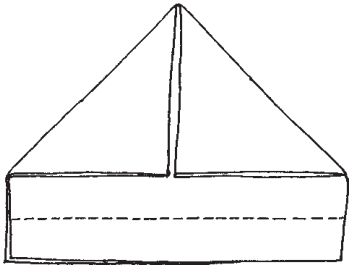
1. Take a rectangular sheet of paper.



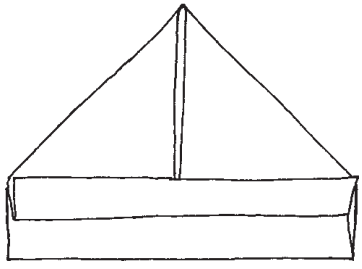
2. Fold into four equal parts.



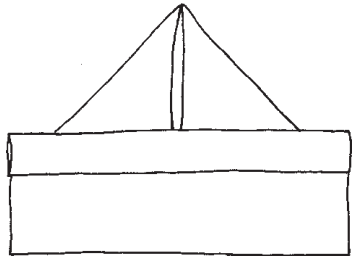
3. Open out the last fold and turn in the corners along the dotted lines.



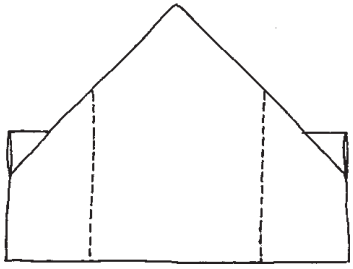
4. Fold the upper flap along the dotted line.



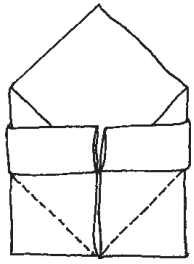
5. Fold it once more.



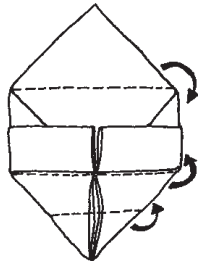
6. Your paper will look like this. Now flip it around.



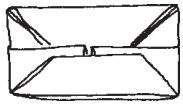
7. Fold along the dotted lines.



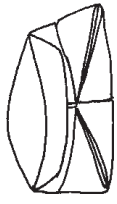
8. Fold along the dotted lines.



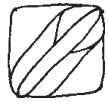
9. Tuck in the top flap after one fold. Fold the bottom flap twice.



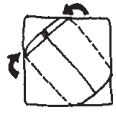
10. Tuck your two thumbs in from the bottom and open out as shown in 11.



11. Press in from top and bottom.



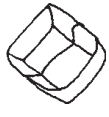
12. Flip it around to get to 13.



13. Fold along the dotted lines to get 14.

14. Flip it around to get 15

15. Open out from the centre.



16. Pinch the corners to get the shape of the box.

The balance is to be made on a flat horizontal surface, which could be a table, a chair or a smooth floor. Sloping desks will not do. For accurate measurement, it is important that the ruler is suspended at its mid-point. If the trays are identical and they are fixed exactly at the two ends (as the drawing in the TextBook shows), then the ruler will balance in this position.

c. Weighing things:

There was some variation in the weights of the matchsticks. With equal number of matchsticks on both sides, sometimes the trays did not balance. The reason was usually obvious, as some matchsticks looked thicker or thinner than normal. With peanuts, chanas and other seeds however, the variation in weight was more. The matchsticks therefore turned out to be the most convenient units. Students weighed different things and completed the Table in their WorkBook.

Sample Table:

In tray 1	In tray 2 (number of matchsticks to balance)
1 matchstick	1 matchstick
2 matchsticks	2 matchsticks
5 matchsticks	5 matchsticks
Chana seed	2 matchsticks
Pea	3 matchsticks
Rajma	8 matchsticks
5 paise coin	17 matchsticks
20 paise coin	8 and a half matchsticks
20 grains rice	19 grains puffed rice

d. Other kinds of balances (Optional)

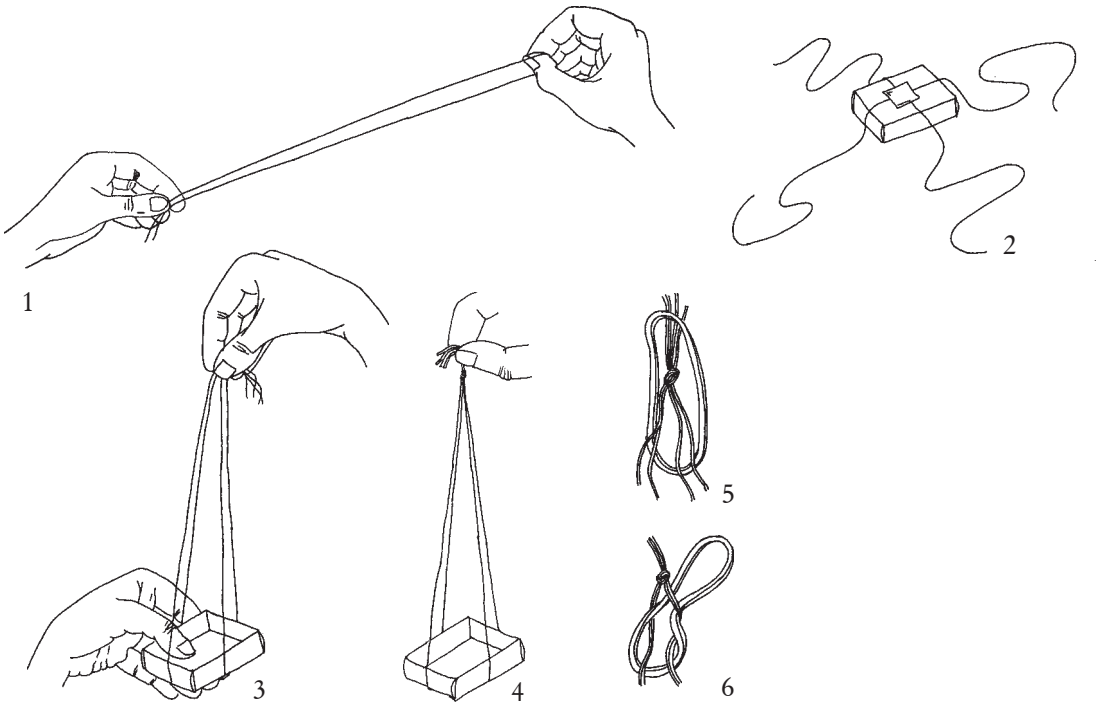
I also tried out two other kinds of balances which I showed to the students. Several of them made these at home and enthusiastically brought them to class.

A Stretching Balance

You will need:
A long rubber-band, a matchbox, some string, and glue or cellotape.

This balance works well if you use a thin stretchable rubber-band. Stiff rubber-bands need very heavy weights to stretch them.

Remove the tray from the matchbox. Cut out two lengths of string, each about as long as your fore-arm. Fold each string in half. Mark its mid-point with a pen or pencil. Put the tray upside down. Keep the two lengths of string across the tray. The strings should cross at their mid-points. Put a piece of cellotape where the strings cross. You can also tie a knot



at the mid-point to keep it steady. Instead of cellotape, you can use a drop of glue and cover it with a small piece of paper.

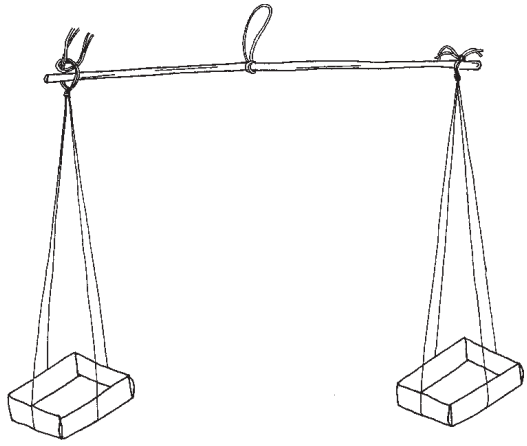
After the glue is dry, turn the tray over. If you like, you can stick the string to the sides of the tray on four sides. Gather the four ends of the string together. Hold them up above the tray. Pass these strings through the rubberband and tie a knot. This is your Stretching Balance.

Hang the balance a the stand or hook and put a simple scale behind it. The vertical position of the knot against the scale will indicate the weight. You can put different things in the tray of the balance, like, pebbles or coins. This balance is much less sensitive than the two-arm balance described in the TextBook.

Grocer's Balance

You will need:
Two matchboxes, some string, a stick from a broom (jhadu), and glue or cellotape.

Make two pans as described for the stretching balance, but with a slightly longer length of string. Tie a loop of string to the centre of the broomstick. Tie the pans tightly to the two ends of the broomstick, so that they hang down at the same level. If the two pans are not balanced, use a small piece of clay or cellotape to make the pans equal in weight.



This balance is a little more difficult to make than the one described in the TextBook, but it has the advantage that students can carry it around and play with it. They can also experiment with different materials for making it.

4. How much water does the bucket hold?

(1 period for demonstration; activity to be repeated as home-work)

I did this activity in the classroom, calling a few students at a time to demonstrate the filling of the water. I showed the students the bucket and the two mugs, and asked them to make their guesses regarding how many (smaller) mugs would fill the bucket. These guesses ranged from "5 mugs" to "14 and a half mugs". While doing the activity, I cautioned them do it slowly and carefully, each time filling the mug to the brim. The actual number turned out to be a little less than 12 mugfuls.

Then the students made their guesses for the bigger mug. Many of them did not at once realize that this number had to be less than the previous one. I asked them this question after collecting one round of guesses. At this point many of them revised their estimates, which were now much closer to the actual number (8 mugfuls). I asked the students to repeat the activity at home (say while having a bath), and to write the results in their WorkBook.

5. Which jar is bigger? *(Three periods)*

For this activity, it is important to get transparent jars of a variety of shapes: some tall and thin, others short and fat. In this way we can show that the word 'bigger' can mean different things. The simplest meaning is, 'taller'. The students see this by arranging the jars in height order.

Next, they find out how much water each jar holds. This gives another meaning to the word 'bigger'. Now students can arrange the jars in order of volume. Yet another meaning which students sometimes use is 'bigger' as in 'wider'. However, this sense is difficult to quantify, especially for jars of irregular shapes.

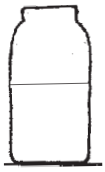
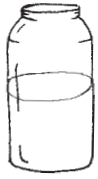
a. Jar parade

I divided the students into groups of 5-7, keeping in mind the requirement of variety in the shapes of jars in each group. Since most students had brought one jar from home, each group had about 5-6 jars. Students found it easy to arrange the jars of their group in height

order. They did this by visually comparing the heights of the jars, sometimes by placing two jars next to each-other.

b. Guess the level

With some trial and error, students became quite good at predicting the level. I reminded them to use the ground line to draw pictures of the jars. I also told them to notice how the jars in the TextBook were drawn in vertical cross -section. They should do the same with their drawings. That is, show

 instead of 

The level therefore could be shown by just a straight line.

It turned out that this drawing activity was quite difficult. Several of the students were unable to show the differences in shapes and heights of the jars. They tended to draw all the jars of the same height and shape. Sometimes they concentrated more on copying the ridges and patterns on the jars rather than on showing the height and shapes correctly. Even when the shapes were approximately right, they could not at once show the water levels correctly. With much trial and error, their drawings improved. I think that this practice in drawing also improved their observation ability.

c. Think and do!

Before doing the activity, I asked for suggestions from the students on how they would find out the capacity. I then gave them time to try solving the problem with their jars. One way was to compare two jars at a time by pouring water from one jar to another. But the previous activity of looking at water levels gave a simpler solution: counting the number of small cupfuls which fitted into each jar. Here it was helpful to start by giving names to their bottles and jars, like, “large pickle jar”, “medicine bottle”, “soap bottle” etc. Once the

number of cupfuls were counted, the task of seriating by volume was reduced to one of seriating numbers (of cupfuls), which the students found easy to do.

6. **Musical beat** *(Double period for Activities 6 and 7)*

In their music class, students had learnt to keep the beat for some songs. Some of them had learnt about 'thaal' (rhythms) in music. They were also eager to sing some of the latest movie songs composed to a disco beat. We selected a relatively quiet song which the whole class could sing together, and keep the beat by clapping. After a few trials, all of them got the clapping beat constant. Then we increased the tempo and repeated the song. I asked them which singing of the song took less time.

7. **Tick-tick counting**

I set the tempo so that each tick-tick took approximately one second. First the class said the tick-ticks along with me. Then the students took turns to come forward and be the 'Timer' for the different activities. Some of the students were not familiar enough with the number system, and they made mistakes in the counting. In this activity, they were forced to think about which number came next, instead of reciting a memorised sequence of sounds.

They timed various activities, like, passing a stick, saying a poem, writing a sentence or making a drawing on the blackboard, and saying the tongue twister, "Kutcha Papad, Pucca Papad", ten times without a mistake.

EXERCISES *(8 periods)*

Observation-based exercises

Name and Draw

1. What a grocer uses to weigh things

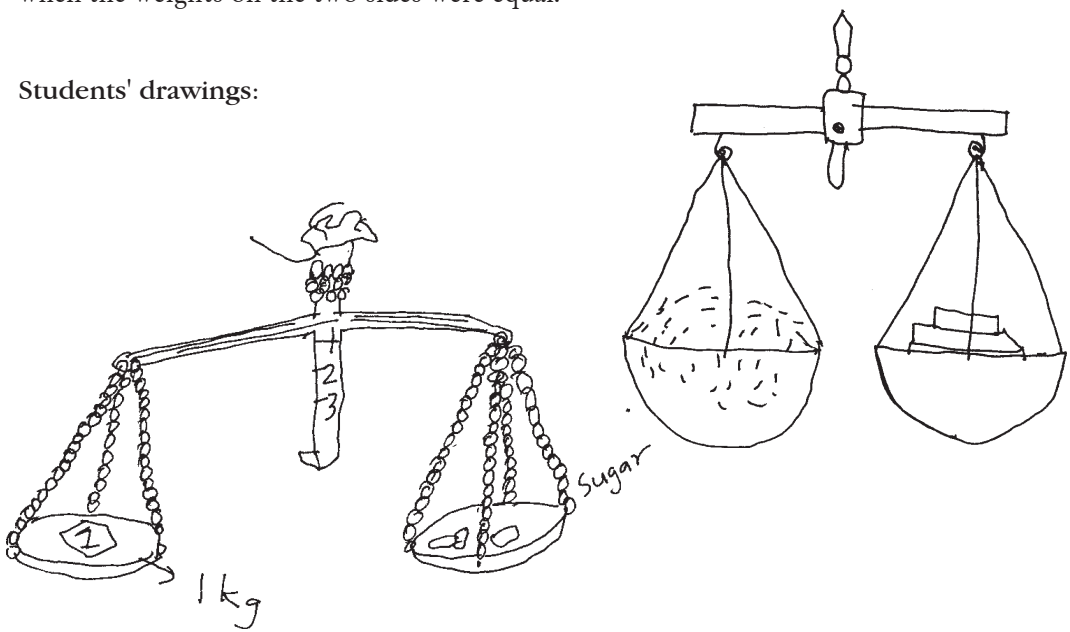
All the students had seen a grocer weighing grain, but most had not observed the process very closely.

They made a drawing of a pan balance (some of them had earlier constructed a grocer's balance with matchboxes).

Some students drew the iron weights in one pan and a pile or a bag of rice etc. in the other. A few students also had an idea of the bigger 'kilogram' weights and the smaller 'gram' weights used by the grocer and vegetable seller. They had bought 'jilebi' and peanuts in grams from the roadside vendors.

However, some students drew groceries in both pans of the balance. This showed that they had not understood the idea of standard weights. I asked how the grocer would know he was giving one 'kilo' of rice. Then they remembered the weights. They also remembered that they had earlier weighed buttons etc. against matchsticks. By drawing some pictures on the blackboard I checked that they knew that the beam of the balance would be horizontal when the weights on the two sides were equal.

Students' drawings:



2. Something that lets you know the time

Most students had observed the face of a clock and had a rough idea of how to tell the time. I did not go into the specific procedure. Some sample drawings are given below:

Quantitative thinking

Short questions

(Questions 1-4 to be done with Activity 3)

1. Arrange the names of these things from heaviest to lightest:

a notebook, a jasmine flower, the teacher's table, a pencil, your schoolbag.

teacher's table, schoolbag, notebook, pencil, jasmine flower

2. Write the names of some things that are so heavy that you do not know how to weigh them.

Students' responses:

elephant, camel, horse, table, truck, aeroplane, helicopter, ship, ...

Students also mentioned things like mountain, tree, building and te1mple, which are difficult to weigh, also because they are fixed in one place. An unexpected response from a student was, "cloud". He said that a cloud was too big and too heavy to weigh.

3. Write the names of some things that are so light that you do not know how to weigh them.

Students' responses:

ant, mosquito, feather, small flower, leaf, blade of grass, piece of thread, hair, dust, smoke, air, piece of paper, paper money, bindi, button, hand of a watch, ...

Some of these things are in fact possible to weigh on the balance that students had made. I asked students to try to weigh them. They found that they were easily able to weigh a feather, a button, a flower, etc.

Two ingenious and unexpected responses here were, "sunlight" and "colour" are too light to weigh!

4. Which is heavier, a bag full of uncooked rice or a bag full of puffed rice?

In the balance activity the students had seen that a grain of puffed rice weighs about the same as a grain of uncooked rice. A bag full of uncooked rice however weighs more than the same bag full of puffed rice. I asked students to think why this was so. (The bag of puffed rice in fact contains fewer grains of rice.)

5. A cup holds 33 small spoonfuls of milk. If you use a bigger spoon, will the cup hold more, or less, or the same number of spoonfuls of milk?

Less

6. One full bucket holds 12 mugs of water. Now you want to fill this bucket with sand instead of water.

a. How many mugs of sand will the bucket hold, if the sand is level in the mug?

12 mugs, same as the water

b. If the sand is heaped up in the mug, will the bucket hold more, or fewer, or the same number of mugs of sand?

Fewer than 12 mugs, since each mug holds more sand

7. Write down the day, the month and the year when you were born.

Several students, especially those from deprived home backgrounds, did not know their date of birth. Some knew only the month and/ or the year, but not the date. I asked the students to write their dates of birth as recorded in the school register. As their class teacher, I could tell them these dates. These were the best approximation available.

8. How old are you? Say your age in years and months.

At first I showed students one example of this calculation (done orally, with dates written on the blackboard):

I was born on 28 July, 1988.

My most recent birthday was on 28 July, 1996.

On that day, I was 8 years old. Some students explained the meaning as, I have lived for 8 years.

On 28 August, 1996, I was 8 years and 1 month old.
On 28 September, 1996, I was 8 years and 2 months old.
Now it is January, 1997.
On 28 January, 1997, I will be 8 years and 6 month old.
Then students used their date of birth to calculate their age in years and months. Some of them could even calculate up to days. One student did the calculation as:

Today's date	26 - 8 - 97
My birth date	10 - 3 - 89
Subtracting, I get	16d 5m 8 years

Of course, this method could not be used in this simple way for all combination of dates, especially involving carry-overs. It might be tried with much older students.

9. **What time does your school start, and what time does it get over?**
   Most of the students knew the school timings.

10. **How many minutes long is one period in your school?**
    Most students said that one period lasted half an hour. I told them that by the clock this time is 35 minutes. Many knew how to count 35 minutes on the clock, and also how to tell time approximately.

11. **Arrange these times from shortest to longest:**
    an hour, a year, a second, a day, the school recess, a week, a minute, a month, the time between flowering and fruiting of the mango tree.
    At first, with some trial and error, students gave this order:
    a second, a minute, an hour, a day, a week, a month, a year

They were not sure where to fit in 'the school recess' and 'the time between the flowering and fruiting of the mango tree', so they put these at the end of the list. After some discussion, they realised that their recess was longer than one minute but shorter than one hour. They also knew that the mango tree flowered at the end of winter and the fruits were ready in summer. So they guessed that this time was more than one month but less than one year. The final order was therefore:
a second, a minute, the school recess, an hour, a day, a week, a month, the time between the flowering and fruiting of the mango tree, and a year

12. You have planted a groundnut seed. Write the events below in the order in which they happened:

The first two leaves came out.	5
The seed became bigger.	3
I put the seed in the mud.	1
The root came out.	4
I watered it for the first time.	2

13. Write the names of some hot things and some cold things.

Students' responses:
Hot things: fire, afternoon, vadapav, mutton, boiling water to make tea
Cold things: ice, icecream, cucumber, evening, cool breeze, spring water

I explained that we were talking about 'hot' as in the Hindi 'garam' and not 'chilli hot' as in 'teekha'. In this question, comparison of temperature (hotness or coldness) was very difficult, and I did not raise the question at this point. In the next question, students had to use some concept of seriation by temperature, which many of them did successfully.

14. Arrange the names of these things from hottest to coldest.

A cold drink	4
Hot food in your plate	2
Ice	5
Tap water	3
Fire	1

Ask and find out

1. **Have you ever stood on a weighing machine? Find out your own weight.**
   Most students had experienced a weighing machine. Some of them had weighed themselves on pavement machines in the city, at a railway station, or at a fair. Many of them remembered their own weight. The boys in the class reported weights between 28-32 kg, while the girls reported weights between 20-30 kg. Some student remembered the number but forgot the units. Some even mentioned the decimal portion of the mumber (eg. 29.7 kg). I told them that it meant something more than 29 but less than 30. I also told them that these were the same 'kilo' or 'kilogram' weights that the grocer used. I asked them to weigh themselves whenever they got a chance, for example, on a visit to the doctor.

2. **Have you watched a milkman distributing milk? Describe what you saw. How does the milkman know how much milk he is giving you?**
   Students had seen different ways of distributing milk: from a can using measures, in bottles and in packets. Some knew the terms litre, half litre etc.

3. **Ask others in your family when they were born. Find out how old they are.**
   Some students knew the birth dates of their brothers or sisters, but not of other members of the family. They found out this information and wrote the birth dates and the ages in their WorkBook.

4. **If you are not well, your mother or father touches you to see how warm you are. Have you ever been checked with a thermometer? What is a thermometer used for?**
   Students knew that your body is warmer when you have fever. Some of them had seen a thermometer, but had not looked at it closely. I brought a thermometer from home and showed it to them.

Figure it out

1. **Apu had some water in a bucket and two empty pots, but his mug was missing. He knew that one of the pots could hold exactly three mugs of water and the other pot could hold two mugs of water. Suddenly, he had an idea! He said, "Mini, Tell me how to use these pots to get exactly *one* mugful of water!"**
   Fill the larger pot to the brim and then pour this water into the smaller pot. Exactly one mugful of water will remain in the first pot.

2. **Mini had some orange juice in one glass and some mosambi juice in another glass. She took a spoonful of the orange juice, put it in the mosambi juice, and mixed it. Then she took a spoonful of this mixture, and put it in the orange juice.**
   Now she asked a tricky question! "Apu, is there more orange juice in the mosambi juice, or more mosambi juice in the orange juice, or are the two amounts the same?"
   This is really a tricky question. Most adults too find it difficult to answer. Despite this problem, it is included in the TextBook, and teachers might well ask, "Why?". The purpose of this question is to `get the mental wheels turning' for all students, and to provide a challenge even to the most gifted ones. Besides, children sometimes have simpler ways of thinking than adults do, and this problem can be solved by a simple, direct approach.

   First think about the orange juice. The result of Mini's activity has been that some orange juice has gone out, and some mosambi juice has taken its place. The final amount of juice is the *same* as it was before.

So exactly as much orange juice must have gone out, as the mosambi juice that has come in. Similarly from the other glass, the same amount of mosambi juice must have gone out, as the orange juice that has come in.)

> For those with a mathematical background:
> What confuses us is that the net amount of juice of both kinds that is transferred is almost certainly less than one spoonful, since some of the orange juice is returned to the orange juice glass along with the mosambi juice in the second spoonful. But this fact is really irrelevant to the main question.
>
> Adults often solve this question with simple algebra assuming, for example, that we start with 'x' spoonfuls of orange juice in one glass and 'y' spoonfuls of mosambi juice in the second glass. This way of calculating assumes that the juices are mixed well, so that the spoonful of juice that is taken from the second glass contains exactly the fraction $y/(y+1)$ of mosambi juice. This is equal to the fraction $1-1/(y+1)$ of orange juice that remains in the second glass.
>
> But it is not necessary that the juices be mixed well. We can understand this by thinking of the orange juice as a collection of white balls and the mosambi juice as a collection of black balls. Supposing one spoonful holds 'n' balls. Then, in the first spoonful, 'n' white balls get transferred to the collection of black balls. In the next spoonful, again there must be 'n' balls. Of these, if 'b' happen to be black balls, 'n-b' would be white balls. The net loss of white balls from the 'orange juice' would therefore be $n-(n-b)=b$ balls. This is the same as the net loss of black balls from the 'mosambi juice'.

CHAPTER 10 How long, how high, how far?

ACTIVITIES

Along a line

1. Growing taller

On a wall at home, mark how tall you are. After every few months, check if you have become taller.

2. Tall and short

a. Write the name of one student in the class who is taller than you, and one who is shorter than you. Will the tallest and the shortest students be able to write these names? Say why.

b. Think and do!

Before you start counting, *think* about how you will do this:
Count the number of students in your class who are taller than you.
Count the number of students in your class who are the same height as you.
(Do not forget to count yourself!)
Count the number of students in the class who are shorter than you.
Add the three numbers that you got.

3. Measure with your body

a. Which is longer, your finger or your nose?

b. How long is the table? Use your hand span to measure it. See what other things you can measure with your hand span.

Do the next four activities at home:

c. How long is your arm span? How many hand spans fit into your arm span?

d. Use your arm span to measure the length of a wall in your house.

Main Index

e. Lie down on the ground and ask a friend to mark your arm span with a piece of chalk. Now check if you are taller than your arm span, or shorter.

f. Walk across the room like this.
Now walk across the room normally.
Now run across.
Now hop across.
Now skip across.
Each time, write down how many steps you took.

4. Measure with other things

Use only two matchboxes for this activity. Find out how many matchboxes can fit in the length of a table. Now guess how many matchsticks would fit into the length of the table. Would it be the same as the number of matchboxes, or more, or less?
Name some other things that you could use to measure the length of the table.

5. How many letters in your name?

Write down your name and count how many letters there are in it.
Write the names of all the students in your class on a square-lined paper like this:

1	2	3	4	5	6	7	8	9	10	11	12
V	A	N	E	E	T	A					
M	U	N	N	A							
M	O	H	A	M	M	A	D				
S	A	V	I	O							
N	I	T	U								

Now answer these questions:
a. How many letters does the shortest name have? Name the students in the class who have names that are the shortest.

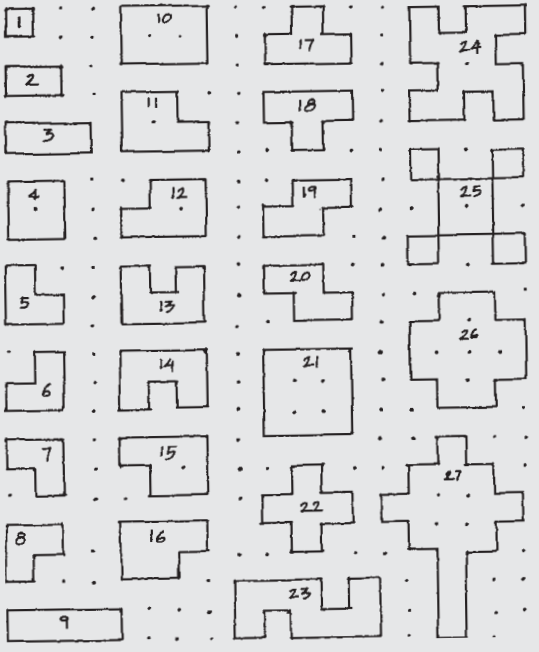
b. How many letters does the longest name have? Name the students in the class who have names that are the longest.

c. How many students in the class have names that are five letters long?

d. What is the most common length of name in your class?

e. What is a length of name which *no* student in the class has?

6. Copy the shapes

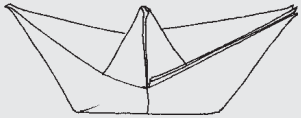


Page 81 in your WorkBook has lines of dots. Copy these shapes on that page. If you do not have a WorkBook, use a square-lined paper.

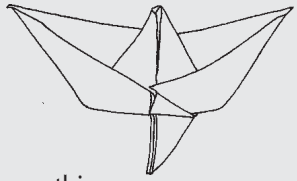
7. Paper boats

Cut two square sheets of paper.

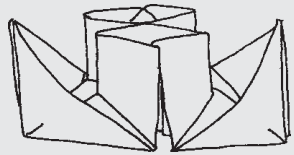
Fold one sheet of paper to make a boat. Your boat might look



like this



or this



or this

Fold the other sheet into four smaller squares.

You are going to make four small boats from these squares. The boats should all be the same kind as your bigger boat. But before you make the small boats, you have to make a guess!

a. Will the big boat be twice as long, or three times as long, or four times as long, as each small boat?

b. Will the big boat be twice as high, or three times as high, or four times as high, as each small boat?

8. The way to school

Draw a picture to show how you go from home to school.

9. Cut and stick

You will need:

a sheet of paper, scissors, old coloured magazines or other coloured papers, glue.

On a sheet of paper, draw pictures of any two of these:

a tree, a cloud, a house, an animal you see around you

Cut out these pictures.

Find some old, coloured magazines. Cut out pieces of coloured paper of the right size and shape to stick on your pictures.

For example, you can cut out a green and a brown shape for a tree.
Trace out the doll (in the TextBook) on a sheet of paper. Cut it out. Now cut a dress out of coloured paper and stick it on the doll.

With your teacher's help, stick together some sheets of newspaper to make a large sheet.

Arrange the pictures made by the whole class on this large sheet, to make a village scene. Draw a river and a street for your village.

DID YOU KNOW?

- The Himalayan griffon vulture has a wing span that is more than double your arm span.
- The wing span of a plaincoloured flowerpecker is about half of your hand span.

ACTIVITIES

Materials to collect

The collage activity requires old coloured magazines, pamphlets or coloured sections of newspapers. Alternatively, glazed paper could be used.

Hints for doing the activities

1. Growing taller *(Double period)*

This activity was done by students at home. I demonstrated how to do it with a friend, using a ruler and a pencil for marking. I warned them to ask the adults in the house before making markings on walls.

2. Tall and short

a. This was a simple activity: most of the students could name one student taller and one shorter than them. Of course, the tallest student in the class could not find anyone taller, and the shortest student could not find anyone shorter.

b. Think and do!

This activity might be possible to do in the PT class or any other time when the students are required to stand in height order. I told the students that this activity was more difficult than the previous one. They had to first think of how to do it.

At first students gave random responses, like, "5 students are taller than me", "2 are shorter", etc.. I insisted that they include all the students in their class. Then I asked if each student needed to do the counting independently. One usually quiet student suggested that the class should stand in height order.

In some schools this might be done normally during the school day, for example, in the PT class. But for these students it was a new experience. First, I called two students to the front of the class and asked the rest of the class to say who was taller. Then I asked the other

Main Index

students to come up, one by one, and stand next to the students in the front of the class. The rest of the class judged where each student would fit into the line.

Occasionally, two students seemed to be of the same height. In such cases, I asked them to
stand side-by-side. In the end, the students were all in height order. Since they knew how many students were present on that day, the counting (starting from the first student) was easy.

Each student added their three numbers:
Number of students in the class taller than me =
Number of students in the class of the same height as me =
Number of students in the class shorter than me =

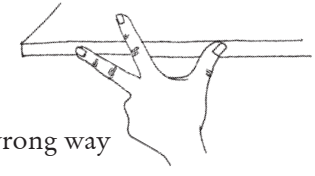
They noticed that the sum of these three numbers was the same for every student, and was equal to the total number of students in the class. The tallest and the shortest students in the class had the first or the last number = 0.

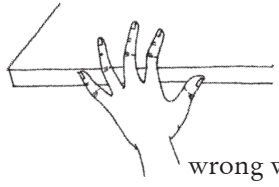
3. **Measure with your body** *(Double period + home-work)*

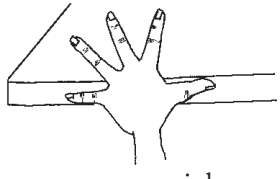
The point to be conveyed through these activities is that different parts of your body can be used for measurement. To measure small lengths, fingers are most convenient. On a longer scale, hand spans can be used, while for still longer scales, arm spans or steps (for measurement on the ground) can be used.

a. The nose measurement is a simple, fun activity.

b. I told students to use their hand span as shown below. I had to show them how to keep their palm flat against a surface:


wrong way


wrong way


right way

(difficult to keep palm against the surface (palm not flat)

Students measured the length, breadth and height of the table. The used the hand spans along with the finger widths for measurement. They appeared to enjoy the activity. I noticed them using the hand span measurement for different things even after the class.

c.-f. Activities to be done at home:
I demonstrated with one student the right way of measuring with an arm span. I showed them that if they stood a little away from the wall, the arm span would be less, and may be different every time. So they should stand flat against the wall. There were too many students for all to do these activities in class. I asked two students to come forward and show exactly what was to be done, and then assigned the activities as home-work.

The number of hand spans of the students fitting into their arm span was about 7, plus or minus a few finger widths. The width of an arm span is remarkably close to one's height. An adult's height usually measures between 7 and 8 of their hand spans. The younger the child, the less is this number. It would be a good project for older students to see how hand span, arm span and height measurements compare across different age groups and genders.

The walking, running, hopping and skipping measurements are mostly for fun, but they also show that the size of our step is different depending on the way we move forward. The need for a standard unit therefore might be felt.

4. Measure with other things *(1 period)*

Matchboxes and matches are standard and easily available measures of length. The matches are slightly shorter than the matchboxes. Comparing the measurements using both of these is analogous to Activity 4 done in the previous chapter, using a large and a small mug for volume measurement.

After the students had done both of these activities, I told them to check the results in their WorkBook. Just as more of the smaller mugfuls of water had fitted into one bucket, so

the number of matchstick lengths fitting in the length of the table was more than the number of matchbox lengths.

5. How many letters in your name? *(1 period)*

I drew columns on the blackboard and demonstrated the writing of a few names. Students wrote out in their WorkBooks the names of all the students in the class. With forty students, this exercise was still manageable. If the number of students is larger, it would be better to split the class into two convenient parts, say girls and boys, or according to their seating arrangement.

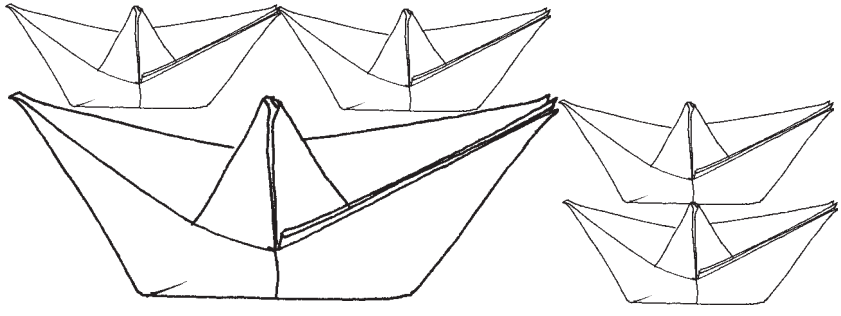
The first two questions in the activity were relatively easy. The next three questions needed some explanation.

6. Copy the shapes *(1 period)*

The activity was enjoyable. Some students did it perfectly the first time, but others had problems in copying the larger shapes.

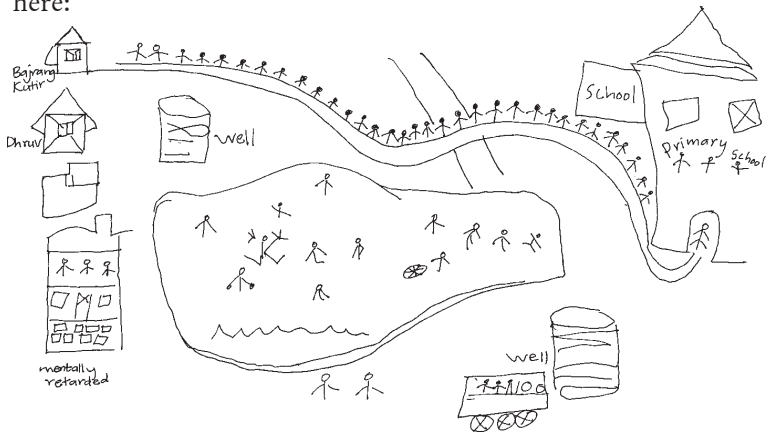
7. Paper boats *(half period)*

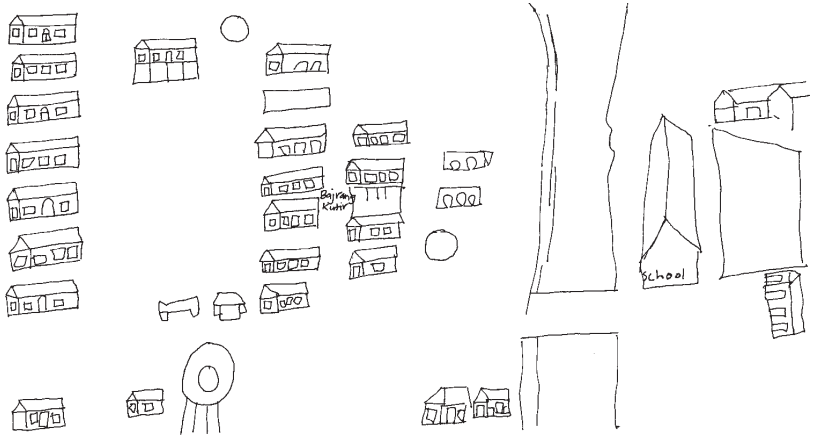
Most students knew how to make one or another of the boats illustrated, though some were not so skillful in making them. On asking them to predict the length of the smaller boats, most were puzzled, but a few answered that the larger boat would be four times the length of the smaller ones. On seeing the result therefore, they were all surprised.



8. The way to school *(1 period)*

There was a wide variation in the maps made by students. Most of the maps were picture-like, although some used schematic representations. Some of their techniques are illustrated here:





7. **Cut and stick** *(2 double periods)*

You need:

White paper, coloured magazines or newspapers or old pamphlets and brochures, scissors and gum.

Students drew the tree, animal, doll, house, cloud or well on a sheet of white paper. Then they had to cut out the coloured paper in the same shape.

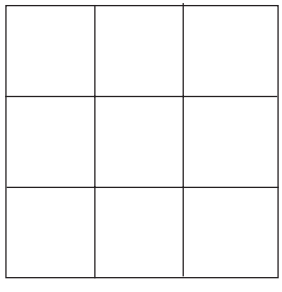
Students used different ways of matching the shapes and sizes in their coloured patches with the figure that they had to cover. Since on the previous day they had done the measurements with body parts (arms, span, fingers, steps), they used their fingers. They kept the coloured paper on the part to be covered and marked off the lengths. Some cut out a shape that was obviously larger, then kept it on the figure, and at the same time cut along the edges. One girl folded the coloured paper to the approximate shape, kept it above the figure, and adjusted the fold till the shape fitted exactly. Then she cut the paper along the fold. This turned out to be the best way, which other children then imitated.

EXERCISES *(4 periods)*

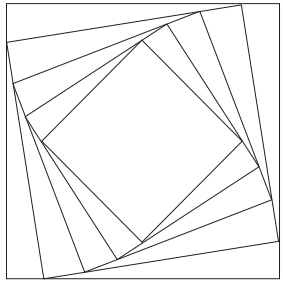
Quantitative thinking

Count!

Count how many squares you see in this picture.



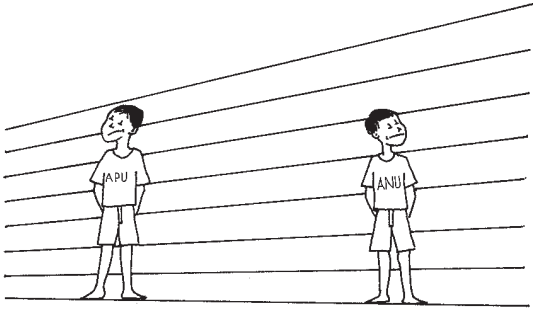
14 Squares



5 Squares

Short questions

1. Anu and Apu had a fight about who was the taller one. You help them to decide.



The boy on the left appears to be taller, but if you compare their heights with a stick, pencil, or ruler, you find they are the same.

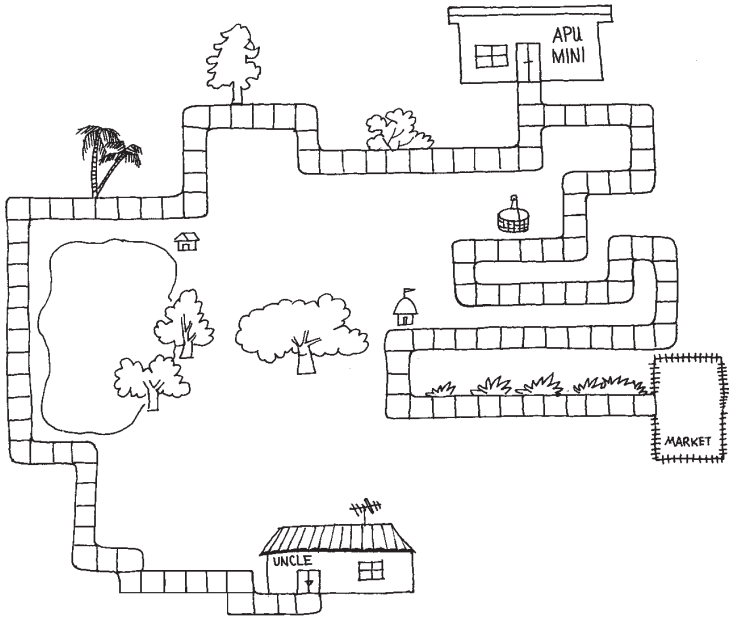
2. Write the names of three things that are taller than you and three things that are shorter than you. Arrange the names of these things from tallest to shortest.

Students' responses (seriated order of things from tallest to shortest):
tamarind tree, elephant, my father, myself, chair, dog, rat

aeroplane, house, door, myself, peacock, bat, ball

clouds, roof, fan, myself, Sanjay, baby, puppy

3. Apu and Mini started from home one day. Mini had to take a letter to Dada's friend's house. Apu had to go to the market. Who walked more?



The distances are actually equal.

4. Write the name of something that is very near to you. Next, write the name of something that is farther away from you. Then, write the name of something that is *still* farther away. Keep doing this until you have a list of at least five things. The last thing in your list could be something that is *very* far away from you.

Student's responses (seriated order of things from nearest to farthest):

my eyes, my shirt, a bottle, another student, girl standing outside, middle school building, the road

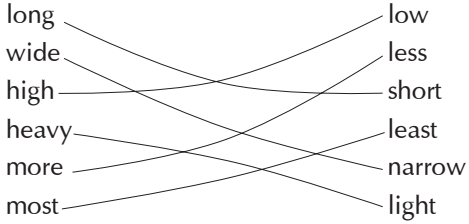
pencil, another student, door of classroom, champa tree, school gate, grocer's shop, my home, my uncle's home, the fair ground, the next town (name), the moon

Students were not very confident about comparing distant distances, but they did talk in terms of the time it took to reach some place: half an hour, one or several hours, a day, two days, etc.. They roughly knew that travel by aeroplane would be faster than by train, which would be faster than a bus and a bullock cart. One student said that distances could be read from milestones, while another student talked about distances shown at the centre of a car speedometer (the distance meter is called an odometer). The questions in *Ask and find out* were discussed at this time.

Language development exercise

Play with words

1. Match these words with their opposites:



Quantitative thinking

Ask and find out

1. Ask your teacher: How far is it from your town or village to the next town or village?

2. We measure large distances in kilometers or miles. Have you ever walked one kilometer or more than that? Do you remember how much time you took to walk that distance?
These two questions were discussed while doing *Short question 4.*

Figure it out

1. Apu and Mini went to the terrace of their one storey house. They had with them a stone and a ball of string. They also had an idea for how they could find the height of their

house. How do you think they did it? (Amma had warned them not to lean out from the terrace!)

A simple way to find the height of the house would be to tie the stone to a string and to let it slowly down from the terrace. The tension in the string would indicate when the stone had reached the ground. Then mark the upper end of the string and draw the stone back up. The length of the string (measured in hand spans or arm spans) woud give the height of the house.

SUPPLEMENTARY EXERCISES

Once the students have got the idea of measurement, you can give them different assignments for comparing or measuring number, length, weight, volume, time and temperature. For example, seriation activities can be done with sticks, stones, leaves, flowers, pencils, kitchen pots, glasses, bags, etc.. Paper-folding activities can be done to show shapes like triangles, rectangles and squares.

Temperature activities can involve keeping two similar stones in the sun and in the shade. The longer the stone is kept in the sun, the hotter it gets, up to a limit. Measures of time can be used and seriated frequently in daily activities. Exercises based on activities are more important for this Unit than verbal exercises.

Quantitative thinking

Short questions

1. **Say if the following things should be counted, weighed with a balance, measured with a cup, or measured with an arm span (you could do more than one of these things).**
   milk, sugar, jaggery, rice, eggs, cloth, kerosene, bananas.

2. **Name some animals which run fast, and other animals which go slow. Arrange the names of five animals from fastest to slowest.**

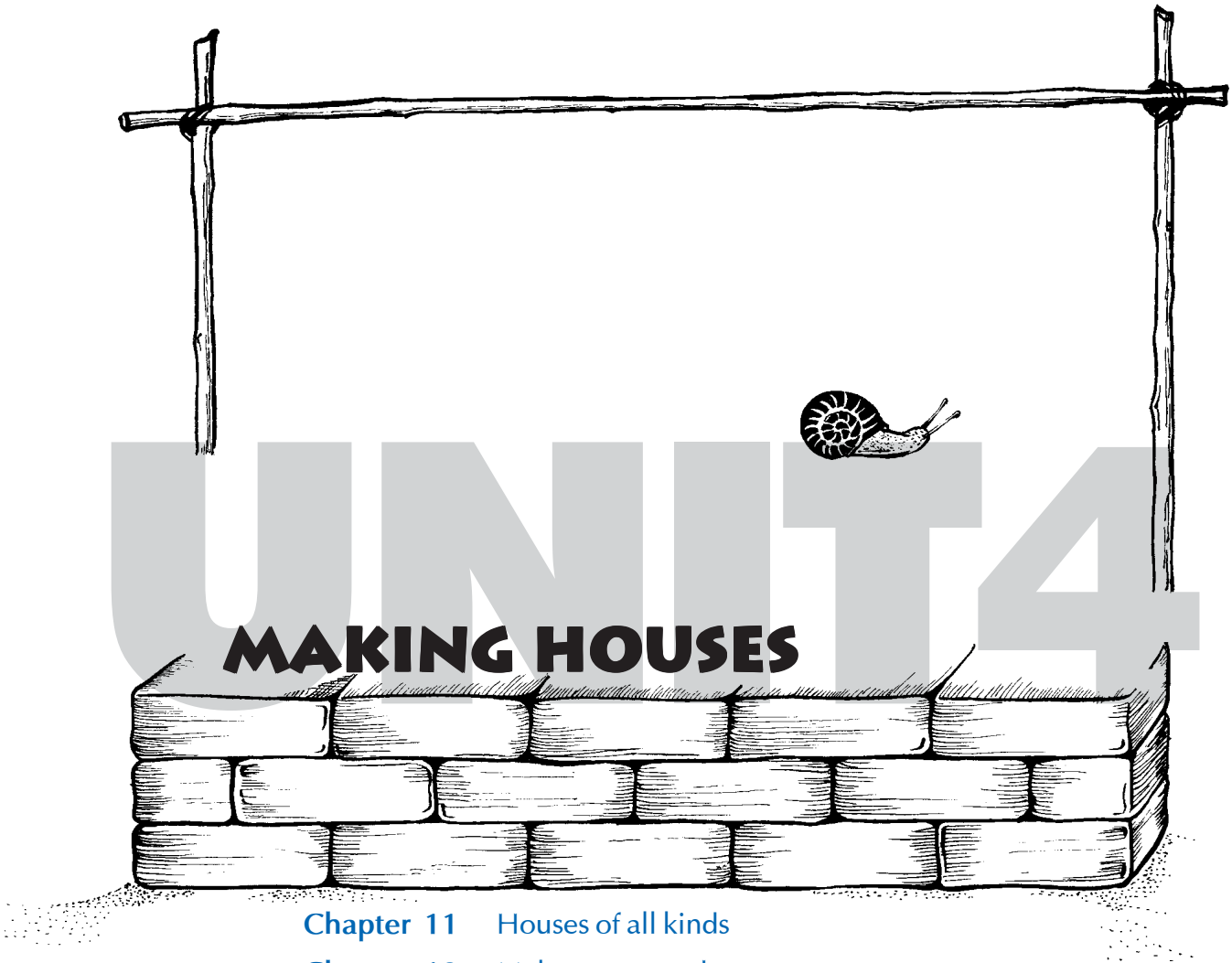
3. **Name some soft sounds and some loud souds.**

4. **Arrange these times from shortest to longest:**
   cooking rice, making tea, plowing a field, walking across the classroom, running across your playground

5. **Hold your breath and ask your friend to count the 'tick-tick' numbers. See for how long you can hold your breath.**

Ask and find out

1. **Find a newspaper that tells you how warm or cold it is today.**
   It is unfortunate that at present only the National and a few State level newspapers give weather information. The activity is therefore more appropriate for urban areas, though all students could be exposed to this idea. Students in my class did not know that newspapers gave the weather. In fact, the local newspapers did not have this information.



UNIT 4

MAKING HOUSES

Main Index

UNIT 4 Making houses

AN OVERVIEW

Objectives

To introduce students to a variety of building materials, and to provide experiences that will help them relate some properties of these materials to their uses:

4.1 Observe homes of different animals
4.2 Observe buildings made by people
4.3 Recognise the building materials used by animals and people
4.4 Make bricks of different kinds of mud
4.5 Test the strength of these bricks
4.6 Construct model houses

What is new in this Unit

In this Unit, we introduce the abstract concept of materials and properties of materials through concrete experiences related to building materials. Students observe the variety of building materials used by animals and people around them. As in the case of Unit 1: The Living World, the content of Unit 4 would be closely determined by the students' immediate environment. The building materials that they learn about would vary depending on the locality.

The focus of the Unit is on building *materials*. The equally interesting, but more difficult ideas about shapes and structures will be explored in the middle school.

The Unit departs from the traditional curriculum in both content and treatment. The topics of solids, liquids and gases, and change of state, occur only in Classes IV and V. The more abstract property of matter occupying space is explicitly not dealt with at all in primary school.

Main Index

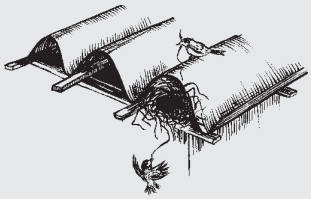
Time-table (P: Number of periods)

Chapter 11: Houses of all kinds

P1	- Story
P2-P9	- Activities
P10	- Summary
P11-P22	- Exercises

Chapter 12: Make your own house

P23-P34	- Activities
P35-P41	- Exercises



CHAPTER 11 Houses of all kinds

STORY

Apu and Mini's house

Mini and Apu were playing house. They had opened out two big umbrellas. Apu was trying to cover them with an old sheet. Mini was sitting inside with Dada's walking stick, holding the sheet up between the two umbrellas. Suddenly there was a wobble and a bump! The stick, the umbrellas and the sheet came crashing down on Mini.

A minute later, Mini's face was peering out from the wreckage.

"Are you hurt, Mini?" asked Apu.

"No." said Mini. "But Apu, we need a stronger house!"

"You are right, Mini," agreed Apu, "A house big enough for the two of us, which does not keep falling down!"

Dada came and sat next to them, "Do you know the story of the crow and the sparrow?"

"Oh Dada, of course we know the story. Amma used to tell it to us when we were so small!"

Mini started, "There was a crow, and there was a sparrow. The crow's house was made of cowdung, and the sparrow's house was made of wax. One day there was a heavy rain, and the crow's house got washed away."

"Poor crow!" said Apu, "I would never make a house of cowdung!"

"Why not?" asked Dada.

"It mixes with water, and gets washed away," Apu replied.

"The sparrow was clever!" said Mini, "Where did it get wax from?"

Main Index

"Perhaps it took an old bee-hive!" Apu said, laughing. "Bees make their own wax to build their house."

"Would a wax house melt in summer?" Mini wondered. "Maybe that is why bees make their hives in shady places?"

"We could make our house out of wax!" Apu said.

"A wax house as big as you? It would not stand up, Apu." Dada smiled. "You know that sparrows do not make houses of wax, and crows do not make houses of cowdung. Everyone makes their house from materials that work well for them. Let us look at different kinds of houses."

ACTIVITIES

What are houses made from?

This is the nest of a tailor bird. The mother and father birds use leaves, stems, grass and cotton to build this nest. They both take care of the baby birds that hatch out of their eggs. Soon the little babies will grow up and fly away.

1. Make a nest

a. Look for a nest from which the little birds have flown away. Make a list of the things that this nest is made of.

b. Collect these things and make a nest like the bird's nest.

2. Homes inside your home

You have seen other living things inside your house. Do they have their own houses?

Watch for holes and cracks in the walls or floors of your house. These could be the doors of other houses! Guess how big the house of an ant or a cockroach might be.

3. What your classroom is made of

Look at all the different parts of your classroom like, walls, roof, floor, doors and windows. Write what these are made of.

4. What your home is made of

Look at the different parts of your house. Write what these are made of.

5. Where people live

Look for different kinds of houses of people around you. Write down what each house is made from.

6. Things that people build

On your way from home to school, look at what you are walking on. Look at the road that buses and carts go on. Look at big roads and small roads. What are these roads made from?
Look on the sides of the road for other things made by people, like, footpaths, drains, bridges, electric poles, postboxes, bus stops and compound walls. Find out what all these are made from.
Look in your house for things made by people. Find out what these things are made from.
Collect some building materials and bring them to school.

Think! Think!

Can you make a house out of sand?

Grass stems are thin and bend easily. They cannot stand by themselves. Then how can a house be made from grass?

SUMMARY

Remember this

Like other animals, we need a house.

A house protects us against heat, cold, wind and rain. A house keeps us safe from animals which might attack us. A house is a place to store our food and other things.

Homes of other animals

Rats, mice and rabbits burrow under the ground to make their homes.

Ants too burrow under the ground. Their houses have many rooms joined by tunnels.

Birds build nests when it is time for them to lay their eggs. At other times, they rest on trees or other places.

The king cobra makes a nest of leaves and sand.

Sometimes, when their babies are to be born, dogs and pigs collect grass, small plants and leaves. With these they make a bed for their babies.

Animals that do not build a house

Scorpions, beetles and cockroaches live in gaps between stones or in cracks in walls.

Most snakes live under heaps of stones, or in burrows made by other animals.

Squirrels and chameleons live in trees or in holes in tree-trunks.

We build houses for our domestic animals.

Houses of people

Our houses can be big or small.

Small huts are made from things we find around us: like, mud, wood, bamboo, leaves and grass.

Large buildings need strong materials like, stone, bricks, cement, steel, glass and plastic. These materials are not always found around us.

Roads

Roads for walking do not have to be strong. They can be made from mud. When it rains heavily, mud roads are difficult to walk on.

Roads for heavy buses and trucks have to be very strong. They are made on top of hard rock. These roads are made from small stones, pieces of rock and tar or concrete. Very strong roads have steel meshes inside them.

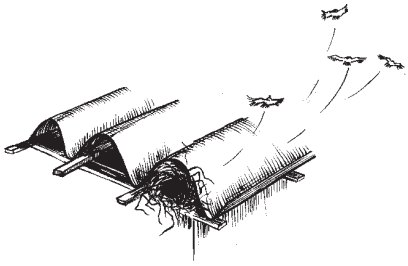
Know these words

material, tunnel, mesh

cement, concrete, tar, plastic, bamboo

DID YOU KNOW?

- Potter wasps build their nests out of mud.
- Paper wasps chew pieces of wood into a pulp. They shape this pulp to make their nest. When the pulp dries, it becomes like tough paper.



teaching ideas

STORY *(1 period)*

Making a house is a favourite play activity of young children. Mini and Apu had probably often made play houses when they were younger. Now that they are bigger in size, putting up a structure to hold the two of them is a more difficult task. It leads to a small accident, which starts them thinking about building materials.

> The story of the crow and the sparrow is an old children's tale from Maharashtra. It was told by Chakradharswami who lived and taught in Maharashtra about 700 years ago. The original story is written in a book called 'Lilacharitra'. In Marathi it is is still one of the first stories told to young children. One current version of the story is briefly as follows.
>
> When the crow's cowdung house got washed out by the rain, he came to the sparrow's house for shelter. The mother sparrow was inside with her babies. She was afraid the crow would harm her babies, so she made all sorts of excuses to delay opening the door: "Wait, I am bathing my baby, now I am dressing her, now I am feeding her, now I am putting her to sleep," etc. Finally, when the crow kept pleading from out in the rain, she did open the door, helped him dry out and gave him food. The crow in turn was a gracious guest, made friends with the babies, and finally saved their lives by fighting a snake that was ready to attack them. Afterwards, the sparrow family helped the crow to rebuild his house.

After reading the story, students commented that a cowdung house would fall down on us. Some students knew that cowdung could be used to layer a mud floor, but others thought it

Main Index

would be dirty. One student said that mud houses are nice to live in the summer - in the rains and in winter a wax house would be nice.

I then asked students what crows and sparrows really made their nests out of. Many of them had seen crows' nests on trees, and sparrows' nests in bushes and inside houses in the niches of walls. They had noticed that nests of crows are larger and made out of twigs, while sparrows make their nest out of softer materials like grass, which they weave into shape. Both however use a variety of materials, like cloth and paper, that they might find in their surroundings. Both crows and sparrows tend to make rather untidy nests. One of the students said that a sparrow had once stolen her ribbons to line a nest.

The discussion went on to other kinds of nests that students had seen. These included nests of woodpeckers, weaver birds, tailor birds and kites. Students also mentioned a caterpillar whose cocoon they called a 'nest'. I introduced Activity 1 at this point.

New words in the story:

wobble, crashing, peering, wreckage, wax, cowdung, bee-hive, shady materials

ACTIVITIES

How I prepared myself

Before doing the activities, I collected information about the different kinds of buildings in our locality. Where I was not sure about the building materials used, I asked my colleagues and others. A friend who had recently built a house was able to tell me some names of materials.

Materials to collect

An old bird's nest is needed for Activity 1. The class had found one during the field trip for Unit 1. It was kept in the class along with their other collections.

I also asked the class to bring some samples of any building materials that they could find, like, pieces of bricks, cement, wood, stone, sand, etc. By the time we completed the last activity of this Chapter, students had made quite a large collection of building materials. At

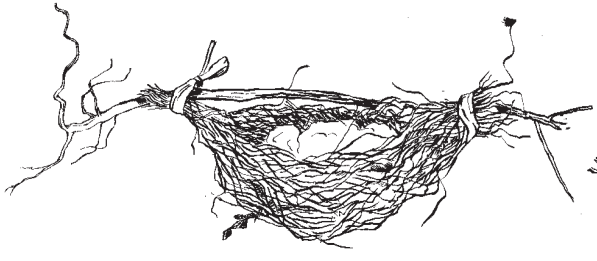
the end of the year they had a display of different kinds of dwellings along with the building materials used in them.

> The tailor birds stitch two or more leaves in the shape of a funnel, using pieces of grass stem or vegetable fibres. They stuff the nest with soft fibres and cotton wool.

1. Make a nest *(2 periods)*

This activity might be easier to do for students from working class, small town or rural areas, who have more experiences of the natural environment and less inhibitions about making things with natural materials. Students from urbanised, white-collar families are sometimes more inhibited. But with some encouragement, all students should be able to do the activity.

The model nest found by the class was a neat cup-shaped one woven out of thin twigs. Students were easily able to recognises the materials used in it, but they were only moderately successful in making a copy of the nest. They did make other nests which did not need such intricate work. They copied many nests they has seen, including nests of a crow, sparrow, bulbul, magpie robin and a tailor bird. Some fixed their nests in a fork of a dried branch, as they had seen the birds do. Others hung them from dried branches using strips of stems.



Nest of an Indian Robin

Nest of a Sparrow

2. Homes inside your home *(1 period)*

Students had noticed inside their house: mosquitoes, flies, moths, ants, cockroaches, spiders, house lizard, sparrows, pigeons, cat and dog. They knew roughly where these animals were found (mosquitoes on water, flies on food and garbage, house lizards in cracks and corners, etc.).

I asked them, out of all these animals, which ones made houses of their own? They knew that ants, spiders, pigeons and sparrows were the ones that built houses. The others looked for sheltered places to stay. In the activities of Chapters 1 and 4, students had observed webs of spiders and had seen ant-hills. Yet, they had not realised that ants might have carved out homes even inside their own houses. I told them that these homes were likely to be several centimetres deep inside the walls or floors of our houses. Termite nests are also quite large. Cracks in which cockroaches shelter are not very deep, and not made by them.

3. What your classroom is made of *(1 period)*

Students had to make observations and complete the Table in their WorkBook. The responses would vary depending on the type of school building. I encouraged students to observe closely, so that they were not satisfied with responses like "bricks" for the wall and "wood" for the windows. They noticed that the walls were constructed out of many other things apart from bricks. Wooden window frames had glass panes, and steel hinges, handles and latches.

Parts of the classroom	**Made of**
Walls	bricks, cement, sand, lime, whitewash or wood, grass, bamboo, ropes, etc.
Floor	Mud, cowdung, cement, tiles
Windows	Wood, glass, iron (nails) or aluminium
...	...

A new building was being built nearby. The students used to pass it every day on their way to and from the school. This was a good opportunity to find out about building materials. (See responses to *'Talk and Write'* Exercise2 of Chapter 12.)

4. **What your home is made of** *(1 period)*

All the students in this class lived in pucca brick or concrete houses. Their list of building materials for different parts of their houses included bricks, cement, water, sand, lime, stone, wood, asbestos, different metals like iron, steel, copper, brass and tin, plastic and glass. I had to tell them some words like, 'aluminium' and 'ceramic'. In completing the Table in their WorkBooks, they included the materials for various fittings in the house, like water taps, wash basins, stone shelves, electric wires, switches, light bulbs, fans and hooks.

5. **Where people live** *(1 period)*

Students knew of huts of different materials, including mud, stone, slate, tar, coconut fronds (leaves), cane, bamboo and cloth (for a tent). They had seen construction workers put up houses with walls made of cane or bamboo mats. They had seen them weave and replace the panels which had rotted in the rain or had got damaged in other ways. In city slums they had seen huts made from plywood, plastic sheets, asbestos cement and tin roofs, and many different kinds of materials that one can get in a city. Students also mentioned underground store-rooms made of stones and wood, boat houses of Kashmir and Kerala, and plastic houses that they had heard about.

6. **Things that people build** *(1 period)*

Students described the roads they had seen as, "brown road", "black road" and "grey road". The first two kinds of roads were close to the school. Through a discussion they explained that the "brown roads" were kutcha roads, i.e. with a mud surface, sometimes compressed by rollers. The "black roads" were made of fine broken stones mixed with tar. The "grey roads" were made of concrete. Students had also seen paths paved with stones, cement tiles and bricks. Some of them described how a road was built.

Students also mentioned buses, carts and rickshaws as things that people build. Their observations might include other structures in their surroundings like, dams, bridges, lighthouses, electricity pylons, etc.

Think! Think! *(1/2 period)*

Many students had made sand castles on the beach. They knew that sand houses break easily and get washed away by the water.

> To use grass in making a wall or the arch of a door, it is first tied into bundles. Since the lengths of grass stems are overlapping, the bundles are longer than the individual grass stems. Thick bundles of grass can be used for arches. Thin bundles are twisted and woven together into ropes and mats, and then used in building. Other natural fibres, like reeds and coir, are also used in this way. Cane and bamboo too are woven into mats for building or covering walls.

SUMMARY *(1 period)*

I explained to students that we need a house for many of the same reasons as other animals need a house. But we use our house for many more things than other animals do. Students gave examples like, cooking, bathing, reading, entertaining guests, etc.

I asked students what would happen if birds just laid their eggs on the ground. They said that the eggs would break, or get eaten up by animals. Without warmth, these eggs would not even hatch. Some birds like jungle fowl and partridges, and some shore and water birds like ducks, gulls and flamingoes do nest on the ground.

Students knew of many animals which do not make houses. Tigers, lions, bears, deer, wolves and dogs find shelter among trees and grass, or in mountain caves.

> Normally, snakes are not able to dig, so they live under stones, or inside holes made by rats or other animals. The female king cobra makes a nest of leaves by enclosing them in a loop of her body, and piling them up by contracting the loop. She loosens sand with her tilted head and again rakes it into the nest with a loop of her body.

I asked the students if all materials were appropriate for making a house. A grass house is cheap and easy to build or repair, and it keeps you cooler than a concrete house. But grass would rot if it remains wet, and it could catch fire easily. In an earthquake however, a grass house is quite stable and causes less damage if it falls.

Some students had seen large structures like multi-storeyed buildings, old monuments, factory towers, dams, bridges etc. I told them that multi-storeyed buildings are built when there are many people who have to live in a small space, as happens in a city. Modern buildings that are more than a storey high need iron girders to support the walls, floor and roof. The higher the building, the deeper has to be its foundation. Foundations of old forts used to be made from stones and molten lead. Nowadays, we use iron and concrete.

Students said that kutcha roads become muddy in the rain. Even tar roads are damaged by very heavy rain or a swift flowing river. They had seen the pot holes after the monsoons. Concrete roads are the most durable of all.

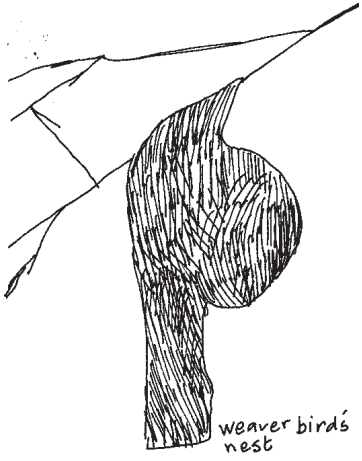
EXERCISES *(12 periods)*

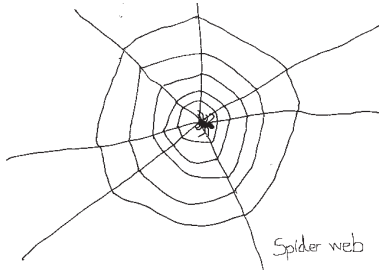
Some sample responses are given for the exercises. In practice, all answers should be drawn from the environment and experiences of the students. Some of these experiences might come from books, stories they have heard, or movies and television. Information about the names of building materials could be found by students by asking older people around them. Local terminology can be used.

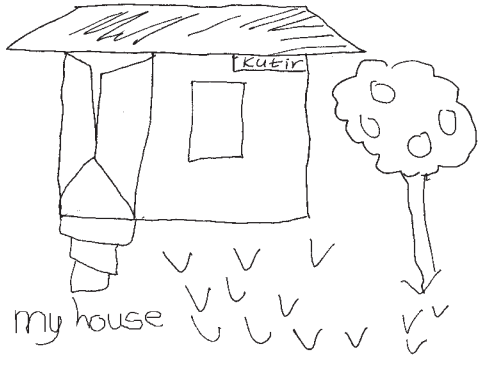
Observation-based exercises

Name and Draw

1. A nest you have seen (name the bird that made it)
2. A house of a spider
3. Your own house







Short questions

1. Which of these large animals make their own houses?

eagle, rabbit, buffalo, cat, rat, rat-snake

eagle, rabbit, rat (make their houses)

buffalo, cat, rat-snake (do not make houses)

2. **Which of these insects make their own houses?**
   bees, mosquitoes, ants, flies, beetles, wasps, termites, cockroaches
   bees, ants, wasps, termites (make their houses)
   mosquitoes, flies, beetles, cockroaches (do not make houses)

3. **Name the different domestic animals that you see in your neighbourhood. Where do they live?**
   In earlier classes, students had learnt the names of animal shelters, like "stable" and "kennel". However they had not seen some of these. I encouraged them to look for shelters that existed around them, or that they had seen somewhere, rather than just recalling names they had learnt. Students mentioned sheds for cattle and horses, chicken coops and a bamboo kennel they had seen for dogs.

4. **Name some materials that people as well as other animals use to make houses.**
   All naturally available materials like, mud, grass, wood, stone, plant stems and other fibres which are woven by people into ropes and mats.

5. **Write which parts of your house are useful for these things:**
   The most obvious responses are given. Any other reasonable responses from students should also be accepted: for example, doors and windows also help to keep the rain out.
   a. Shade from the sun (roof, walls)
   b. Keep the rain out (roof, walls)
   c. Let in sunlight and some breeze (windows)
   d. Let people come in and go out (doors)
   e. Don't let thieves come in the night (door-latches and peepholes)
   f. Make the house look beautiful (decorations, paint, plants -paint on walls and doors also helps protect the house from damp and insects)

6. **What different materials are walls made from?**
   Students mentioned both house walls and compound walls made of mud, stone, bamboo rods, cane or other mats, bricks, concrete blocks, wood, plywood, coconut fronds,

canvas cloth and plastic (for tents). They said that compound walls can be made of wire fence covered with creepers. Mud walls can be covered by straw mats to protect them from the rain. I told them that in some large buildings, a wall could be made entirely of glass fixed in steel or aluminium frames.

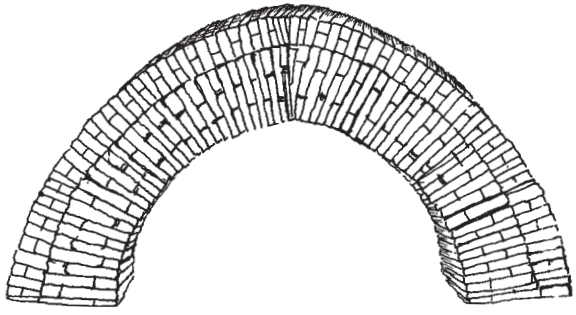
7. What different materials are floors made from?

Mud covered with clay and cowdung, tiles of different kinds of stone, cement, concrete, ceramic, clay, bricks, bamboo and wood. Some large and expensive buildings use tiles of stones like cudappah, granite or marble.

8. What different materials are roofs of houses made from?

Many students pointed out that a roof needs a supporting structure, made of wood or steel, which is then covered by different kinds of materials. The most common roofs that students had seen were made of clay tiles like mangalore tiles, corrugated sheets of different kinds (asbestos cement, fibre concrete, PVC (Poly Vinyl Chloride), galvanised iron or aluminium). RCC (Reinforced Cement Concrete) roofs are built around iron girders and meshes.

Grass, straw, reed, palms or tree barks are used for different kinds of thatched and woven roofs. Wood and bamboo are also used to make roofs. Students were interested to know that a vaulted roof can be made from stones or bricks, without the use of any supporting structure - except while the roof is being built.



Vaulted roof

9. **You want rainwater to flow down from your roof. In what shape would you make this roof?**
   Sloping or conical. We can also make *nalas* or channels to drain the water from the roof. This water can be collected and used.

10. **What different materials are doors and gates made from?**
    I asked students to notice the body as well as the fittings like, hinges, handles, latches etc.. Their responses included wood, plywood, PVC, bamboo, iron, aluminium, leather, coir or jute rope and cloth (canvas). They had also seen brass fittings on doors.

11. **Your windows should let some light come into the house, but should keep out wind and rain. What material will you use to make such windows?**
    Glass lets in light but keeps out wind and rain. Clear plastic is also sometimes used. In some houses, windows or 'jalis' set into a deep wall serve this purpose.

12. **Which of these materials become soft when you put them in water?**
    glass, wax, mud, steel, stone, grass
    mud and grass (Do become soft. Grass becomes soft if it stays in water for several hours)
    glass, wax, steel and stone (Do not soften in water)

13. **Which of these materials become very hot when you keep them out in the sun?**
    iron, wood, grass, stone, bricks, leaves
    iron, stone (feel very hot) bricks (feel less hot) wood, grass, leaves (do not feel hot)

14. **You have named many building materials. Say which of them are found around us, and which are made by people.**
    Responses to Short Question 4 gave materials found around us (that is, naturally available materials). Students also added to this clay, wax and lime. I was very impressed by these responses, as they showed students interpreting 'materials found around us' as not just in their particular surroundings, but also in other local surroundings. Of the materials made by people, ropes, mats and leather might be locally made, while cement, glass or iron would be made in factories and transported to the building site.

What's same? What's different?

1. Give two similarities and two differences between:

a. Steel and wood

We make rods out of both. Both are used in building, i.e. making roofs, walls and floors. Wood is strong, but steel is stronger and so used to make tall buildings. Wood can be cut by a hand-saw. Wood is brown and rough while steel is shining grey.

b. Bricks and stones

Both are used for making walls. Both are hard, but stone is harder - a stone can scratch a brick. Bricks are made from mud by people while stones are found in the ground. Stones are broken out from mountains.

c. The nests of crows and sparrows

Both are untidy and both hold eggs. Crows' nests are usually made of twigs and small branches, while sparrows' nests are woven and therefore made of more pliable materials, like grass. The materials vary according to the surroundings. For example, crows near construction sites might also use strips of iron.

2. Find the odd one out:

a. bulbuls, *scorpions,* ants, people (make their own house)

b. bricks, cement, *wood,* plastic (materials made by people)

Language development exercises

Talk and write

1. Why we need a house

(What would happen if we lived out in the open during the day? At night? In the rainy season? in winter?)

2. House of an animal

(Where did you see it? Which animal did it belong to? What was it made of? What else did you see there?)

Play with words

1. **Fill the squares!**
   We need a house to protect ourselves against heat , cold, wind and rain.

2. **Search here for these building materials: bamboo, steel, glass, brick, grass, cement, wood, stone.**

S	G	C	T	D	S
T	R	E	H	W	T
B	A	M	B	O	O
R	S	E	M	O	N
I	S	N	O	D	E
C	S	T	E	E	L
K	G	L	A	S	S

Ask and find out

1. **You might have seen a circus tent. Why is a circus housed in a tent and not in a large building?**
   Apart from circus tents, students had seen cloth, canvas and plastic tents used by migrant people like construction workers, travelling entertainers and medicine sellers. A tent can be rolled up and transported (piece by piece, for a large tent) in a truck. Since a circus has to move from place to place, a tent is necessary.

2. **Talk about building materials with your parents or other older people. Do they know about buildings made from other materials?**
   Students had found out about old buildings made of granite, sandstone and marble. They knew of the Taj Mahal in Agra, made from white marble. Some had visited cave temples carved in black (basalt) stone.

3. What were buildings made out of when your parents were children?

Some materials that used to be seen in old buildings but have now gone out of use are, 'saag' (teak) wood, large blocks of stone, and 'chuna' (lime). Teak wood was commonly used for building. But it was used up faster than we could generate it. Now most of our natural teak forests have been cut down. A teak tree takes about 50 years to grow to full height and to develop good strong wood.

In the last few decades, a number of new building materials have become available, and more are being made all the time. Wood has been replaced by metals like steel and aluminium where more strength is needed, and by cheaper wood products like plywood, block boards, fibre boards, and a variety of others.

The use of reinforced concrete has meant that multi-storeyed buildings are possible, and so are a variety of kinds of structures. For example, overhanging balconies in old buildings had to be supported by pillars. In concrete buildings these pillars are not necessary. Large blocks of stone are rarely used now. Prefabricated blocks are made of lightweight materials containing varieties of concrete, along with fly ash (the waste materials from thermal power plants) or plant fibres. 'Chuna' (lime) has been largely replaced by cement.

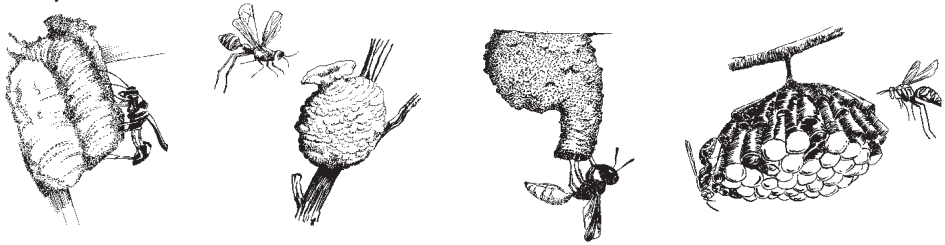
Various composite materials used today are made of blends of polymers, polymer fibres, plant fibres or metals. Roofs, partition walls, windows and doors are now commonly made from PVC or fibre plastics. Fibre glass is a more expensive option.

DID YOU KNOW?

Wasps, bees and ants are related insects. More than 100,000 species of them are known throughout the world. The more evolved ones of these species build their own homes.

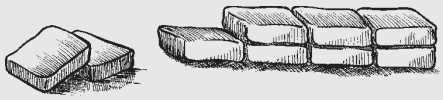
Mud wasps are known as "" in Hindi and "Kumbharine" in Marathi. Their nests are often seen stuck to the windows or walls of our houses. Only the

female wasps build nests. The "mud dauber wasps" collect wet mud, while potter and mason wasps spit out drops of water to moisten the soil from which they make their nest. The female wasp stings a spider, or the caterpillar of a moth or butterfly, and keeps their paralysed body inside each mud pot. Then she lays an egg near it. The larva which hatches out finds the caterpillar ready for it to eat.



Mud-dauber wasp *Potter wasp* *Mason wasp* *Paper wasp*

The paper wasp scrapes pieces of wood from fallen trees, poles or houses. She chews this dried wood which mixes with her saliva. She shapes the pulp with her jaws and spreads it into thin layers like paper. The nest is at first small, made of a few cells, with one egg in each cell. When the wasp larvae hatch, the mother wasp catches flies and other insects to feed them. After the wasps grow up, they help the mother to build more cells. Gradually, this nest could grow three or four feet across, holding a colony of thousands of wasps.



CHAPTER 12 Make your own house

ACTIVITIES

Build with mud

1. Different kinds of mud

You will need: Two or three types of mud from different places near your home or school, like, a farm or garden, a playground, a pond or stream, a path, a building site or a potter's workplace, water to wet the mud. For each kind of mud:

a. Remove the stones and look at the mud. Describe the colour of the mud.

b. Rub the mud between your fingers and palm when it is dry, and again when it is wet.

c. Smell the mud when it is dry and again when it is wet.

d. Rub the mud on paper.

e. Check if the mud is easy to wash off your hands.

Take care!

Do not get mud from dirty places like garbage dumps or outdoor toilets!

After you finish playing in mud, wash your hands and nails well! If you eat with muddy hands, dirt and germs will get into your stomach and make you sick.

2. Let's make bricks!

You will need: two empty matchboxes, two or three kinds of mud, newspaper to spread on the floor, mug and bucket of water.

• Mix the mud with a little water so you can shape it with your hands.

• Cut open the outer cover of a matchbox. This is your *mould*.

Main Index

• Press a small lump of mud in the matchbox, cover and close it. Remove the excess mud.
• Take the brick out of the mould.
• Make about 10 bricks in this way.
• Let your bricks dry.
• Make bricks out of another kind of mud too. You will need these for the next activity.

3. Do and think!

You can also shape bricks with your hands. Then why do you need a mould?

Which is heavier, a wet brick or a dry brick? Why?

Dry 5 bricks in the shade, and 5 bricks in the hot sun. Which set of bricks dry faster? Which set of bricks do you think are stronger?

4. How strong are your bricks?

You will need: bricks you have made out of different kinds of mud, a piece of building brick, a stone and a plate of water.

Drop each kind of brick from the same height. Which bricks break?

Hammer each kind of brick gently with a stone. Which bricks break easily?

Soak each kind of brick in a plate of water. Which of the bricks soften easily with water?

Which ones are the strongest bricks?

Think! Think!

Are your bricks strong enough to make a real house? What would happen to the house after a heavy rain?

You have to choose bricks to make a house. Should the bricks be strong or crumble easily? Should they be light or heavy?

5. Build a wall

Collect the bricks made by you and your friends. Put them together to make a wall. Which way of stacking makes a stronger wall? Can you find a way to make your wall even stronger?

How would you make a wall that does not fall down easily?

6. Build a house

You will need: The mud that made the strongest bricks in Activities 2 and 3, a sheet of cardboard, newspaper and water.

You may also think of other materials to help you make your house.

Make bricks out of the mud. While the bricks are wet, stack them together to build a house. Press the bricks down gently as you stack them. This will make them stick to each other.

Make sure your house has at least one opening for a door, and one for a window.

Find a way to make a roof for your house.

Draw a picture of the house you made. Label the parts of the house. Write the names of the materials you used to make the house.

7. Back to the mud

Your toy houses will make the school look nice. At the end of the school year, take your bricks and houses and put them back in the soil where they came from.

SUMMARY

Know these words

stack, stick, hammer, crumble

DID YOU KNOW

- When sand is pressed inside the earth for billions of years, it turns into very hard sandstone. The Red Fort in Delhi is made from sandstone.

teaching ideas

ACTIVITIES

Materials to collect

Mud from different places, plates, matchboxes, water for washing hands; sheets of newspaper or old plastic sheets to spread on the floor; large container to mix the mud (optional); a sieve, in case the mud has too many lumps and pebbles.

Rules of work

All the activities were done in groups of 4 or 5 students. Mud activities can be messy, so I made some rules before the students started (some of the problems are avoided if the activities can be done outdoors):

(1) Work only within your group - do not carry the mud and water around!
(2) Use the water and containers provided - do not use your water-bottles and lunch-boxes!
(3) Clear up with a broom and a mop after you have finished!

Hints for doing activities

1. Different kinds of mud *(Double period)*

Students brought a variety of different kinds of mud, like, garden soil, soil from a pond bank and from the side of a road. One student suggested getting mud from an ant-hill. They worked in groups and did the tests described in the TextBook for each kind of mud.

> Mud is something we all take for granted. Yet all our food comes from it, and it is also the most plentiful building material around. In any locality, we can find at least two or three different kinds of mud. Mud is usually a mixture of gravel or small stones, sand, silt, clay and organic matter - that is, decaying material from dead plants and animals.

Main Index

> Rubbing the mud between the fingers and palm of the hand tells us quite a lot about it. A sandy soil feels rough and does not stick together when wet. A silty soil feels slightly rough, but it does stick together when it is wet. Clayey soil makes hard lumps that are difficult to crush, but when wetted, they become very sticky. Lumps of clay swell up when they are wetted, and crack when they are dry.
>
> Sandy soil is the easiest to wash off your hands, and clayey soil is the most difficult. Clayey soil is also the best for building.
>
> The smell of the soil shows the amount of organic matter in it. Soil which is rich in organic matter has a rich smell which becomes even stronger on putting water it. This soil is very good for growing plants, but not good for building.

During this initial exploration, I helped the students to describe the appearance, colour and smell of the different kinds of mud. They used descriptions for the mud, like, 'field mud', 'pond mud', 'mud near the principal's office', etc. I had to introduce some words for colour (for example, 'greyish brown', 'reddish brown', 'dark brown', etc.), and for texture ('rough', 'smooth', 'sticky' etc.). Although these words were not very exact, they helped students to enrich their vocabulary and to describe their experiences better.

After the exploration, I helped each group to select two or three types of mud that clearly appeared different. For example, some groups chose: (1) mud from a pond shore, (2) from a garden and (3) sandy soil from a building site. Some groups selected only two types of mud. They wrote the results of testing these in their WorkBooks. Some sample results are given below. In every locality, the results would be different.

Sample results:

1. Pond shore mud

Colour : Greyish brown
Rubbing test (dry) : Fine and smooth with some hard lumps

Smell (dry) : *Not much smell*
Rubbing test (wet) : *The lumps swelled and then broke up into a smooth, sticky soil*
Smell (wet) : *Sharp smell*
Washing off : *Difficult to wash off*

2. Garden mud

Colour : *Reddish brown Rubbing test (dry): Rough*
Smell (dry) : *Pleasant smell*
Rubbing test (wet) : *Less sticky than pond mud Smell (wet): Smell like after the rain*
Washing off : *Easy to wash off*

3. Sandy mud

Colour : *Light greyish brown*
Rubbing test (dry) : *Very rough, with small pebbles*
Smell (dry) : *Not much smell*
Rubbing test (wet) : *Rough*
Smell (wet) : *Dusty smell*
Washing off : *Very easy to wash off*

2. **Let's make bricks!** *(3 periods, including some exercises)*

The '*Talk and write*', '*Figure it out*', and some other exercises were done along with this activity.

The students continued to work in groups, with the same muds that they had tested earlier. I told them that bricks made of fine soil would be stronger than those made from soil with pebbles or trash in it. They could try this out at home. In the classroom, I helped the students to sieve the mud for making bricks.

Sheets of newspaper are useful to hold the mud. Since newspaper sometimes tears, plastic sheets can be spread on the floor. I got these by cutting open some old plastic bags. Each group prepared the mud for the brick and house-making activities on these sheets of newspaper or plastic. Alternatively, mud for the whole class could be prepared together in a

bucket with a stick to mix the mud.

Either the inside or the outside cover of the matchbox can work as a mould. This cover is fairly water proof. At least 5-6 bricks can be made from one matchbox cover before it tears.

The students arranged the bricks to dry on sheets of newspaper. They lined up the bricks in rows of 10 or 20 and then counted them. In this process, they revised their addition and multiplication tables too!

3. Do and think!

This activity is best done on a sunny day. Bricks dried directly in the sun tend to crack, so it is best to dry them in the shade. In a hot, dry place, the bricks will be dry in a day. In cold or damp weather, the bricks will take a few days to dry.

4. How strong are your bricks? *(Double period)*

> This is a somewhat rough experiment to show that different muds have different properties which are important to consider when you use them as building materials. Apart from the type of mud, there are many other factors which could affect the strength of the brick - for example, how well the mud is sieved, how well it is mixed, how hard it is pressed into the mold, where it is dried etc. The procedure of the experiment too has problems from a strict scientific viewpoint.
>
> But even with such a rough experiment, it is possible to get the main idea, that properties change with materials. The results are best if clearly contrasting types of mud are used. A good choice is: fine clay, garden soil and sandy soil.

To do the dropping test, I asked students to start by dropping the bricks from knee height in a squatting position, as shown in the TextBook. If the bricks did not break, then they dropped them from waist height, then shoulder height, and finally from as high as their arms could reach. This procedure has the problem that the bricks would develop some cracks in the

previous trials, making them easy to break in the later trials. Ideally therefore, a different set of bricks should be used for each trial. However, for simplicity, we used only one set of bricks.

Sample results:

1. Pond shore mud bricks

Dropping : Did not break even when teacher dropped it with hand held high.
Hammering : Did not break with gentle hammering.
Soaking in water : Swelled up with water and became very soft.

2. Garden mud bricks

Dropping : Broke when dropped from waist height.
Hammering : Broke with gentle hammering.
Soaking in water : Broke up into pieces, but slower than the sand brick.

3. Sandy mud bricks

Dropping : Broke easily from knee height.
Hammering : Broke up completely with gentle hammering.
Soaking in water : Broke up as soon as we put it into water.

Of these three types of mud, students were convinced that the pond-shore mud made the strongest bricks, followed by the garden soil. The sandy mud bricks were the weakest. Overall in the class, the strongest bricks of all were those made from cement. Fine soil collected from an ant-hill also made fairly strong bricks.

In some cases however, the results were more difficult to interpret. A piece of commercial brick, about the same size as the students' bricks, broke when dropped from the teachers' height. But when put in water, it did not disintegrate like the others. That is, in comparison with the clay brick (pond shore mud), it broke easily on dropping, but was much more resistant to water. Often, bricks dried in the shade were more difficult to break by dropping and hammering, in comparison with bricks dried in the sun (this was perhaps because the sun-dried bricks had more cracks). In water however, the sun-dried bricks took longer to disintegrate.

To make these results more understandable to students, I told them that baked bricks were a little like glass. A glass brick would break more easily than a brick made of, say, wheat dough. But if you put the two bricks into water, the wheat dough would mix in the water, not the glass. So a glass (or baked brick) building would last longer in the rain, but not in an eathquake. In Japan, where earthquakes are common, paper is used as building material.

Yet another kind of strength is important in building materials, which for simplicity is not included in the TextBook. This involves seeing how much weight a beam of any material can support before it breaks. In the middle school years, students will actually do such experiments. Right now we want to only start them thinking, so that in a few years they would be able to make more complex arguments about appropriate building materials for different purposes.

Think! Think!

Students were sure that building materials should be strong, but were not sure if they should be light or heavy. Light materials are easier to handle and build with. If they fall, they do not cause so much damage. Heavy building materials like stones have a disadvantage as was seen in the devastation caused by the 1993 earthquake in the Latur District of Maharashtra (the stones here were not cemented together). The difficult part is to get materials that are light and strong at the same time. Some traditional materials like bamboo, and many new synthetic materials, like polymer composites (plastics) and fibre glass have got this property.

5. Build a wall *(1 period)*

The students in a group put their bricks together to make a wall. They could see that with the first way of stacking the bricks, the wall could fall over with the slightest push. If the bricks were arranged in an alternating manner, as in the second drawing, the wall had to be pushed harder for it to fall over.

Can you find a way to make your wall even stronger?

Students suggested binding or sticking together the bricks and plastering the wall with mud.

How would you make a wall that does not fall down easily?
Some students who had seen a wall being built knew that first a pit is dug. It is filled with stones or bricks. This is the foundation for the wall, which is like the roots of a tree - it helps the wall to stand up. The foundation has to be thicker than the wall. It is deeper for a wall which has to support more load, like the wall of a house (in the same way that a tall tree has roots that go deep into the soil. Foundations of large buildings are made of reinforced concrete.

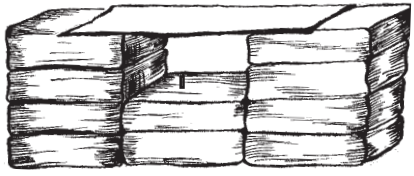
> Cement is made from a mixture of limestone and clay. The mixture is ground into fine powder, mixed with water, and heated to about 1450° C. All organic matter in the mixture is burnt off, and water and carbon dioxide are removed. What is left is a mixture of oxides of calcium, aluminium and silicon. This is mixed with gypsum and ground to powder again.
>
> When cement is mixed with water, it changes to a very hard substance. To make concrete, sand and gravel are added to the cement along with water. The sand and gravel help to reduce the amount of cement necessary, while also adding to the strength and hardness of cement.

6. **Build a house** *(3 periods)*

Building a brick house is a challenging task, and a very good learning opportunity. Students have to solve problems like, how to bind the bricks together, and how to construct window frames. They realised that to make doors, windows and roof for a brick house, you need other materials for support.

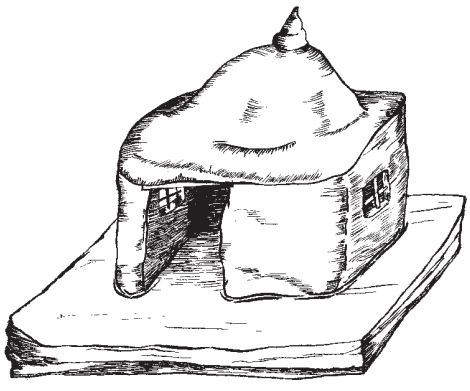
All the student groups came up with some problems in making the house, but they also devised ways to overcome the problems. Those who tried to make a large house found that the walls were too heavy and tended to collapse under their own weight. Plastering walls with wet clay also led to the same problem. Without a foundation, it was difficult to provide any support. The most successful houses were therefore the small ones, built on a base of

tile, asbestos or cardboard coated with mud. The roof was made from old notebook covers or thick cloth coated with mud. Some groups painted their houses or made a garden around it. The windows and doors used thin strips of old plywood or cardboard for a frame. This is shown in the figure.



Instead of using mud bricks, students could make a house with other materials, like cardboard, sticks, or rolled-up sheets of newspaper. Thermocol is a strong and easy material to work with, but it is expensive and it pollutes the environment! Use thermocol only if it is available as waste material.

Students' drawings of their houses were interesting. Usually they showed all the details, including doors and windows which were on the opposite wall so could not be seen. Sample drawings:



7. **Back to the mud** *(1 period)*

At the end of the year, the students have to put their houses back into the mud. Some of the students were reluctant to do this. I told them that no house is ever permanent. Mud houses have to be repaired frequently, especially before and after the rains. Brick and concrete houses have to be repaired or partly rebuilt every few years. Stone houses are perhaps the most lasting: they weather over hundreds of years.

Putting their houses out into the open was a learning experience for students. They learnt what the wind and the sun can do. If there is rain, they could have an opportunity to watch the house being dissolved. This need not be an unpleasant event at all. As they see what was happens, they could think about where the material for the house came from, where it is going back, and whether they have changed anything in this process.

EXERCISES *(7 periods)*

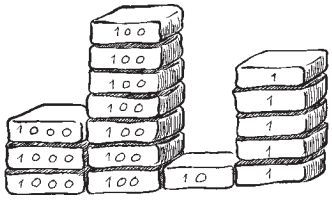
Quantitative thinking

Count!

1. Mini has stacked her bricks. She has 8 bricks in each row and 7 rows one above the other. How many bricks does she have?

Some students got the answer by drawing the bricks and counting. A few used multiplication 8 X 7=56.

2. Make different numbers using your bricks:



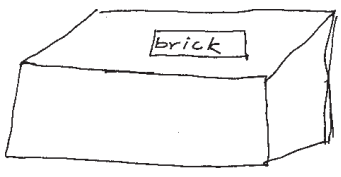
3000 + 700 + 10 + 5 = 3715

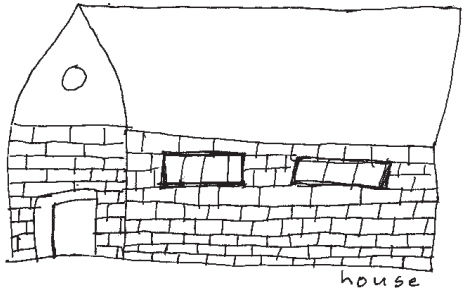
This exercise was useful to revise the idea of place value in arithmetic. It could also be used as an abacus to do simple addition problems.

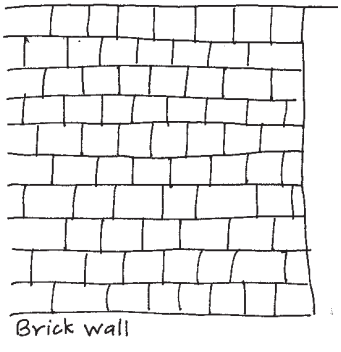
Observation-based exercises

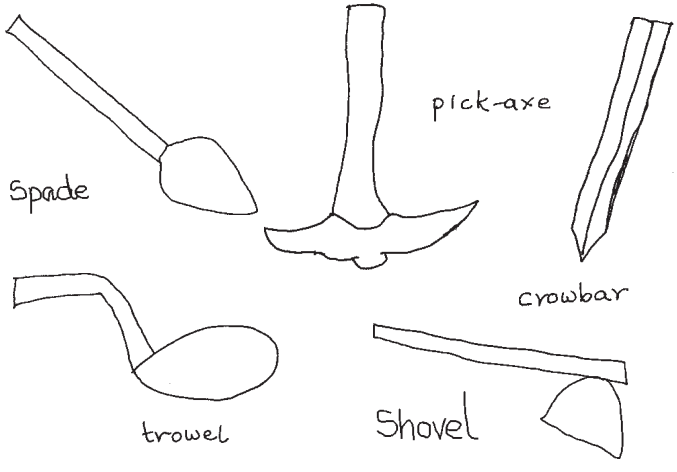
Name and draw

1. One brick
2. A brick wall
3. Different kinds of houses you have seen
4. Tools used by a mason









What's same? What's different?

1. Give two similarities and two differences between:

a. Garden soil and sand

Both are kinds of soil. Both look darker when wet. Garden soil is darker in colour than sand. It becomes lumpy when wet. Plants grow well in it but not in sand. Sand is found in the desert and on the sea shore.

b. Mud and cement

Both become sticky when wet, both are used in making houses. Mud is brown, red and many other colours, cement is grey or white. Mud is found around us, cement is made in a factory. After it dries, cement is harder than mud, so it makes a stronger wall.)

c. A wet brick and a dried brick

Both are made of mud, they have the same shape. They both lose their shape in water. The wet brick looks darker in colour, it is softer and heavier than the dried brick.

Language development exercises

Talk and write

1. How I made the bricks

Describe in a letter to a friend how you did these activities.

I took some wet mud.
I opened the cover of a matchbox.
I put some mud in the matchbox.
Then I pressed it.
I opened the cover and took out the brick.
I put the bricks on paper to dry.

Some students also described how they made clay forts during Diwali.

2. I saw a house being built

Tell your teacher: What did you see there? How many people were helping to build the house?

Describe what they were doing, what materials and what tools or machines they were using.
This was an oral activity. Students described in the class how a recatangular pit was dug for the foundation. Steel pillars (girders) were put in the four corners. Wooden planks were fixed around these to make a box. A mixture of cement, gravel, sand and water was poured inside, and left to dry. Students has also seen the cement mixers. They described how walls were built using wooden planks and stretched strings to help the masons build in a straight line. A framework of steel girders was used to make the roof. Roof of a shed made of corrugated sheet had to be tied down to a wooden frame so that it would not fly away.

Ask and find out

1. How are building bricks made?

Bricks are made from a mixture of clay, other kinds of soil, rice-husk and water. This mixture is shaped in a mould. The mud for making building bricks has about 20%-50% clay content. Finer soil is used to make roof tiles. In different regions of India, the soils have different mineral contents, resulting in different colours of bricks like, deep red, pink, orange, yellow, brown or greyish. Sometimes bricks are also made by compressing waste materials.

After drying, the bricks are stacked in a pile with layers of coal between them. This is called a brick kiln. When the coal is burnt, the bricks become very hot. The temperature inside the kiln is about 900^{o} C to 1000^{o} C (less than the temperature needed for making cement). The minerals in the clay melt and get bonded together into a glassy ceramic material. The rice husk helps to heat the bricks uniformly. After the rice husk gets burnt, the bricks become porous. Thus, burning makes the bricks strong and light.

2. What materials are used in building a brick wall?

Some students had seen a broken brick wall, with the bricks and cement inside it. Several of them had also watched a wall being built, and could describe the procedure. In the '*Name and draw*' exercise, they had shown the tools used in this process.

Things used: bricks, mortar and plaster (both are made by mixing cement, sand, water and often lime), whitewash paint. A flat wooden plank and a string are used to make sure the wall is built straight.

Quantitative thinking

Figure it out

1. One cup of wet mud can make 7 bricks. How many bricks can be made from three cups of wet mud?

21

2. First guess the answer to this question. Then do it and see. One cup of dry mud is mixed with one cup of water. How many cups will the mixture fill?

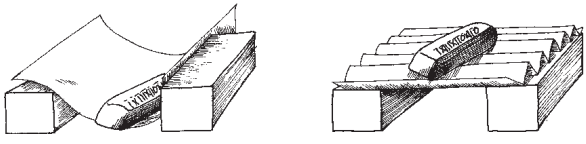
This exercise was done with the brick-making activity. Some students gave the answer as '2 cups'. But many knew intuitively that the result would be less. In fact the result was about one and a quarter cup for most kinds of mud.

Ask a question

Student's question:

1. Why are 'corrugated' sheets shaped like that?

Corrugated sheets can support more weight than plane sheets. You can see this by making two roofs of paper, one folded like a fan, and the other plane. See which one supports more weight.



DID YOU KNOW?

> Monuments like the Red fort, Qutub Minar, many temples, and large building of the British period were made from sandstone. Sandstone is made when sand is heated and compressed inside the earth for billions of years.

SUPPLEMENTARY EXERCISES

Observation-based exercises

Name and Draw

1. Different building materials
2. Different kinds of houses
3. Different kinds of doors (with latches, handle etc.)

Language development exercises

Talk and Write

1. Nests I have seen
   What different kinds of nests have you seen? Where were they built? What were they made of?
2. My house
   What are the materials used in different rooms?

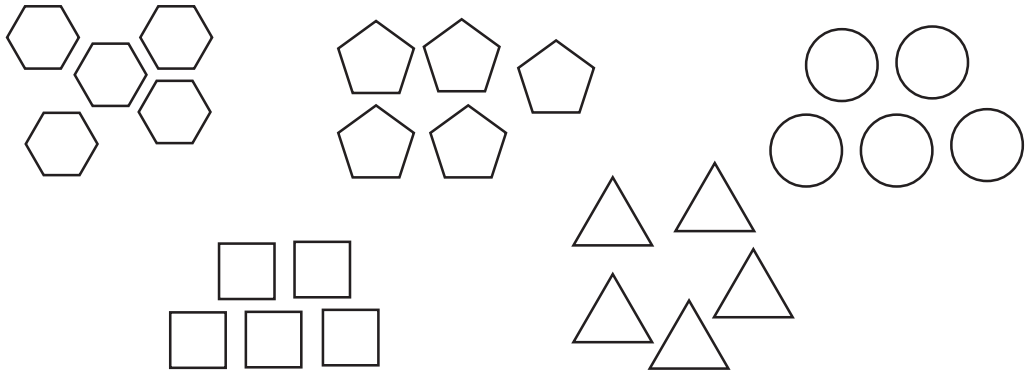
Ask and find out

1. Observe the animals around your house. Find out where they live.
2. Are the roads around you used by heavy buses and trucks? Are they used in the rainy season too? Do they sometimes get washed away? Are there roads that do not get washed away by the rain?

Quantitative thinking

Figure it out

1. These are clay tiles of different shapes. Which of them can you use to tile a floor, without leaving any gaps? (The exercise could be done by cutting paper in tile shapes)



Glossary

GLOSSARY OF FOODGRAINS, VEGETABLES, FRUITS AND FLOWERING TREES:

ENGLISH	HINDI	MARATHI
Cereals		
Barley	Jav/ Jau	Jav
Bulrush/ Spiked/ Pearl millet	Bajra/ Bajri	Bajra/ Bajri
Common millet	Chena	Vari
Corn/ Maize	Makki/ Makka	Makka
Finger millet	Ragi/ Mandika/ Marwah	Nachni/ Nagli
Great millet/ Sorghum	Jowar/ Juar	Jwari/ Jondhla
Oats	Jaie	Jai
Rice	Dhan/ Chawal	Bhat/ Tandool
Wheat	Gehon	Gahu
Pulses		
Bengal gram/ Gram	Chana	Harbhara
Bengal gram (black)	Kala chana	Kale chane
Bengal gram (kabuli)	Kabuli chana	Kabuli chane
Black gram	Udad/ Urd/ Mash	Udid
Kidney bean	Rajma	Rajma
Chickling vetch/ Chickling pea	Chattri-mattri	Lakh
Cow Pea	Lobia	Chawli

Main Index

Field/ Garden/ Green pea	Mattar	Vatana
Green gram	Moong	Mug
Moth bean	Moth	Matki
Lentil	Masur/ Beng	Masur
Pigeon pea	Arhar	Tur
Soybean	Soyabean/ Bhat	Soybin
White pea	Saphed matar	Pandhre vatane

Vegetables

Bulbs and Roots:

Beetroot	Chukandar	Beet
Carrot	Gajar	Gajar
Garlic	Lahsoon	Lasoon
Radish	Mooli	Mula
Turnip	Shaljam	Salgam

Starchy Tubers and Roots:

Colocasia/ Elephant ear/ Edible arum	Arbi/ Guiyan/ Arvi	Alu/Akhi/ Dhueya
Elephant foot Yam	Jimikand	Suran
Potato	Alu	Batata
Sweet Potato	Shakarkandi	Ratalee
Tapioca	Tikhoor	Cassava
Yam	Ratalu	Goradu

Gourds:

Ash gourd/ Wax gourd/ White pumpkin	Petha	Kohala

Bitter gourd/ Balsam pear	Karela/ Kareli	Karla
Cucumber	Kakdi/ Kheera	Kakdi
Little gourd	Kundroo	Tondli
Red Pumpkin	Kaddu	Tambda Bhopla
Ridge gourd	Kali Tori/ Turai	Dodka
Snake Gourd	Chachera/ Chichinda	Padwal
Sponge Gourd	Ghiya tori/ Nenua	Ghosali
White Gourd/ Bottle gourd	Doodhi/ Lauki/ Ghia	Dudhe bhopla
Pointed Gourd	Parwal	Parwal
Squash Melon/ Round Gourd	Tinda	Tinda
Yellow Pumpkin	Sitaphal/ Kaddu	Kashi Bhopla
Beans:		
Broad bean	Baakla	Papdi
Carpet legume	Sem	Wal
Castor	Erand	Erandi
Cowpea	Lobia	Chawli beans
Drumsticks	Sejana	Shevga
Field Vetch/ Cluster beans	Guar	Guwar
French beans/ Kidney beans	Farash bean/ Jungli Same	Shravan ghevda
Lima bean	Sem	Double bean
Sword bean	Bean	Abai/ Ghevda
Tamarind	Imli	Chinch
Velvet beans	Khamch/ Tohar sem	Bin/ Khajori
Groundnut(Peanut)	Singdaana/ Mungphali	Bhuimug/ Sheng

Leafy vegetables:		
Amaranth	Chaulaie, Soya sag	Chavli, Shepu, Rajgira, Math, Tandulja.
Beet leaf	Palak (desi)	Palak
Cabbage	Patta gobi/ Band gobi	Kobi
Drumstick leaves	Sejana ke patte	Shevga
Fenugreek leaves	Methi ke patte	Methi
Goosefoot	Bathua	Chakwa
KnolKhol	Gaanth gobi	Nawalkhol
Lettuce	Salad	Salit/ Letus
Portulaca	Kulfa	Ghol
Purple cabbage	Baingani band gobi	Jambhli kobi
Rumex	Sag	Chuka
Mustard leaves	Sarson	Sarson
Spinach	Vilayti palak	Palak
Spring onions leaves	Pyaj ke patte	Kandya chi pat
Tamarind leaves	Imli ke patte	Chinchch chi pat
Other vegetables:		
Brinjal	Baingan	Vangi
Capsicum	Shimla mirchi	Dhobli mirchi
Cauliflower	Phool gobi	Phulkobi/ Fulvar
Cress/ Garden cress	Pani dhleem	Aliv
Lady finger	Bhindi/ Okra	Bhendi
Mushroom	Kukurmutta	Alimb
Raw mango	Kaeri/ Ameya	Kaeri

Raw banana	Kutcha kela	Kutchi keli
Tomato	Tamatar	Welwangi/ Tambati

Condiments and spices

Anise	Saunf	Shep
Aromatic Cardamom	Choti Ilaichy	Ilayachi/ Velchi
Asofoetida	Heeng	Hing
Betel vine	Paan	Nagvel
Bishop's Weed	Ajwain	Owa
Black Mustard	Kali sarson	Kali Mohri
Black Pepper	Kali Mirchi	Miri
Cardamom	Elaichi	Veldode
Castor	Rehri	Erandi
Chilli	Lal mirchi	Mirchi
Coriander	Dhaniya	Kothimbir/ Dhane
Curry Leaves	Kadipatta	Kadipatta
Cumin	Jeera	Jire
Dill seed	Soya	Sowa/ Balanshep
Fennel	Sonf	Badishep
Fenugreek	Maythi/ Methi	Methi
Ginger	Adrakh	Ale
Indian Mustard	Rai	Rai
Large Cardamom	Bari elaichi	Masala velchi
Long pepper	Mirch	Pippali
Mint	Pudeena	Pudina
Nutmeg	Jaiphal	Jaiphal
Safflower	Kusum	Kardai

Sesame	Til	Til/ Tili
Sunflower	Surajmukhi	Suryaphool
Turmeric	Haldi	Halad
White Mustard	Banarsi Raie	Pandhari Mohri
Fruits		
Apple	Seb	Safarchand
Apricot	Khubani	Apricot
Banana	Kela	Keli
Bengal almonds	Badam	Badam
Bengal currants	Karwande	Karwand
Bullock's heart	Ramphal	Ramphal
Cape gooseberry	Rashbhari	Phopti
Cashewnut	Kaju	Kaju
Chestnut	Akhroat	Akroad
Coconut	Nariyal	Naral
Dried coconut	Kopra	Kopra
Currant	Kishmish	Bedaana
Custard apple	Shareefa	Seetafal
Dates	Khajoor	Shindi/ Khajoor
Fig	Anjeer	Anjir
Grapes	Angoor	Draksha
Guava	Amrud	Peru
Indian gooseberry	Amla	Awala
Indian jujube/ Chinese date/Chinese fig	Ber	Bor
Jackfruit	Katahal	Phanas

Lemon	Bara nimbu	Limbu
Lime/ Sour lime/ Acid lime	Kagzi nimbu/ Khata nimbu	Kagdi limbu
Litchi	Leechi	Lichi
Mango	Aam	Amba
Mulberry	Raitun/ Shehtut	Shetur/ Tuti
Musk Melon	Kharbooja	Kharbuj
Olive	Jaitoon	Jatoon
Orange/ Mandarin	Santra/ Narangi	Santre
Papaya	Papita	Papai
Peach	Adu (Aaroo)	Pich
Pear	Nashpati	Pear
Pineapple	Ananas	Ananas
Pistachio	Pista	Pista
Plum	Alubukhara	Alubukhar
Pomegranate	Anar	Dalimb
Raisin	Munakka	Manuka
Raspberry	Raspberry	Gauriphal
Rough lemon	Nemboo	Jamburi/ Edlimbu
Sapodilla plum/ Sapota	Chikoo	Chiku
Shaddock/ Pomelo	Chakotra	Papanas
Sugarcane	Ookh/ Ganna/ Kamad/ Naishakar	Oos
Sweet lime	Metha Nimbu	Shakkar nimbu
Sweet orange/ Malta/ Mozambique	Mosambi	Malta/ Mausmee
Water melon	Tarbuja	Tarbooj/ Kalingad
Java plum/ Indian allspice	Jamun/ Jaman	Jaambul

Trees and Plants

Acacia	Babool	Babhul/ Babal
Adina tree	Kadam	Kadamba
Aegle marmelos	Bael	Bael
Arjuna	Arjun	ArjunAshoka
Ashok/ Sita Ashok	Ashoka/ Jasundi	
Australian phyllode Acacia	Bitti	Bitti
Babul/ Gum arabica	Subabhul	Subabul
Bamboo	Bans	Baambo
Banyan	Bad/ Bar/ Bargad	Vad/ Wad/Vat
Baobab/ Monkeybread tree/ Cream of tartar tree	Gorakhaamli	Gorakh chinch
Beefwood/ Casuarina	Jangli suru	Suru
Bermuda grass	Durbha	Durva
Betel-nut Palm	Supari	Supari
Blue gum tree (Eucalyptus)	Nilgiri	Nilgiri
Bottle palm/ Royal palm	Taad	Tal
Cactus	Saihud/ Nagphani	Nivdung
Cannon ball tree	Tope gola / Kailaspati	Kailaspati
Cashew nut tree	Kaju	Kaju
Catechu	Katha	Acash/ Khair
Cedar	Toon/ Tun-ka-jhar	Tun/ Kunant
Copper pod/ Rusty shield bearer	*	*
Climbing bauhunia	Bel bauhunia	*
Climbing palas	Beltivas	Palaavela
Crepe myrtle	Chinaimendhi/ Farash/ Saoni	Chinaimendhy/ Dhayti

Devil's tree	Chaitian	Satvin/ Shaitan.
Drumsticks/ Horse radish	Soanjana/ Sainjan/ Suhunjna.	Shekta chi sheng
Fish-tail/ Sago palm	Mari	Birli mahad
Flame of the forest	Palas/ Dhak/ Chalcha/ Kankrei	Kakracha/ Palas
Goldmohar/ Flamboyant	Gulmohur	Gulmohur
Indian almond	Desi badam	Badam
Indian beech	Karanj	Karanj
Indian butter tree	Mahua/ Mohwa	Mahwa
Indian cork tree/ Jasmine tree	Akas neem/ Minichambeli/ Neemcahmeli	Akas neeb/ Buch/ Kavla-nimb
Indian coral	Pangri/Pharad/ Dadap	Pangri
Indian laburnum	Amaltas	Bahava
Jacaranda	Nili gulmohur	Nili gulmohur
Jujube	Bor/ Ber	Bor
Lac tree/ Gum lac tree	Kusim/ Kosom	Kusim
Lahura	Rugtrora	Rakhtreora
Large flowered dillinia	Chalta/ Chaltr	Karmbel/ Mota Karmal
Lucky bean tree	Putranjiva	Patravanti
Magnolia tree	Champa	Chapha
Mast tree	Ashoka/ Debdaru	Ashoka
Margosa	Neem	Nimbay/ Kadulimb
Persian lilac/ Bead tree/ Bastard cedar	Dake/ Drek/ Bakain/ Baken	Pejri/ Bakan nimb
Pink cassia	Java ki rani	*

Pipal	Peepal	Pimpal
Plantain	Kele ka ped	Keli cha jhad
Pongam/ Indian beech	Karanj/ Paper/ Papre/ Kanji	Kanji
Purple bauhinia/ Camel hoof tree	Gulabi kachnar	Rakta kanchan
Mountain ebony	Gairal/ Kaliar	*
Portia/ Tulip	Bhendi/ Pipal	Bendi/ Ranbhend
Queen flower/ Pride of India tree	Arjuna/ Jarul/ Zarul	Taman/ Mota-bondara/ Bondara lendi
Rain tree	Belaiti siris	Velaiti siris
Rhododendron	Buras	*
Roxburgh's kydia	Baranga patha	Bhendi/ Bhoti
Sacred barna	Barna/ Barua	Waruna/ Kawan
Sandalwood	Sandal/ Chandan	Chandan
Sausage tree	Jhar phanoos	*
Scarlet bottle brush	Lal botal brush	*
Scarlet cordia	Lal lasora/ Bhokar	Bhokar
Sesban	Agastya	Agastya
Bombay rosewood/ blackwood	Sheeshum	Sheeshum
Silk cotton / Bombax	Sevri/ Simal/ Shamali	Semul/Kate savari
Sprout- leaf plant	Panbudi / Panphuti	Panphuti
Tamarind	Imli	Chinch
Temple tree/ Frangipani	Champa/ Chameli/ Gul-e-chin	Khair Chapha

Teak tree	Sagvan/ Sag/ Sagun	Sag/ Sagwan
Tulip tree/ Scarlet fountain tree/ Scarlet bell tree/ Squirt tree/ Fountain tree/Syringe tree/ Uganda flame tree	Rugtoora	Rugtoora
Tree of Heaven	Maharuk	Mahanimb
Tal palm	Tad	Tar/ Tal
Wavy-leafed Tocoma	Rugtrora	Rakhtreora
White bauhinia	Jhanjora	Aapta
White frangipani/ Pagoda	Saphed champa	Pandhara chapha
White gulmohur	Sandesra	Sandesra/ Sankasura
Wild date palm	Khajoor	Khajoor
Yellow silk cotton tree	Gooloc/ Galgal/ Kumbi	Galgal/ Pivli savar
Flowers		
Balsam	Gulmhendi	Terda
Canna	Keli	Kardal
China rose	Chini gulab	*
Chrysanthemum	Guldaudi	Shewanti
Cluster fig	*	Umbar
Coral jasmine/ Queen of the night	Harsingar	Parijat/Parvati
Cotton	Rui	Kaapus
Flax	Alsi, Tisi	Alashi
Foetid cassia	*	Takla
Ginger lily	Sontakka	Sontakka

Holy basil	Tulsi	Tulas
Jasmine	Jai, Jui, Mogra, Kausar	Jai, Jui, Mogra
Jute	Jita-pat/ Gutipat	*
Lantana	*	Satrangi/ Ghaneri
Lotus	Kamal/ Padma	Kamal
Marigold	Genda	Gond/ Zendu
Musaenda	Pedina	Bhutkas/ Bhutkesa
Night jasmine	Raatrani	Raatrani
Periwinkle/ Vinca	Sadabahar	Sadafuli
Rose	Gulab	Gulab
Sesba	*	Agastya
Shoe flower	Jaswanti	Jaswand
Sun flower	Bhanupadma/ Surajmukhi	Suryaphool/ Bhanupadma

REFERENCES:

Pulses/ Cereals/ Vegetables/ Oilseeds:

Director, Indian Council of Agricultural Research: Handbook of Agriculture, Indian Council for Agricultural Research, New Delhi, 1992.

Bishwajit Cowdhary: Vegetables (India- The Land and the People), National Book Trust(NBT), New Delhi, 1996.

Ranjit Singh: Fruits (India- The Land and the People), National Book Trust(NBT), New Delhi, 1995.

A. V. S. Sambamurty & N. S. Subrahmanyam: A Textbook of Economic Botany, Wiley Eastern Limited, New Delhi, 1974.

Trees:

M.S Randhawa: Flowering Trees, NBT, New Delhi, 3rd Edition, 1993.

H. Santapau: Common Trees (India- The Land and the People), NBT, New Delhi, 1996.
Chakravarti S. Venkatesh: Our Tree Neighbours, National Council of Educational Research and Training, 1976.

E. Blatter and Walter S. Millard: Some Beautiful Indian Trees, Bombay Natural History Society (BNHS)/ Oxford University Press (OUP), 1993.

Further reading

CHILDREN'S BOOKS

1. Some books published by the National Book Trust (NBT), A-5 Green Park, New Delhi 110 016 (Many of these books are in the Nehru Bal Pustakalaya series. Most of them are available in Hindi and other translations):

Pranav and Smita Chakravarti: Our Trees (picture story), NBT, New Delhi, 1985.
Ruskin Bond: The World of Trees, NBT, New Delhi, 1975.
H. C. Madan: Once in a Village..., NBT, New Delhi, 1988.
Ravi Paranjpe: A Story About Water, NBT, New Delhi, 1992.
Jamal Ara: Watching Birds, NBT, New Delhi, 1970.
Jit Rai: Wild Woodnotes, NBT, New Delhi, 1982.
Ruskin Bond: Who is Who at the Zoo, NBT, New Delhi, 1974.
Ramesh Bakshi: Our Beautiful Peacock, NBT, New Delhi, 1988.
Ramesh Bijlani: Our Body, NBT, New Delhi, 1986.
Rekha and Yatish Agarwal: The Story of Blood, NBT, New Delhi, 1984.
Mulkraj Anand: Some Sreet Games of India, NBT, New Delhi, 1983.
Mikki Patel, Pulk Vishwas and others: Homes (picture story), NBT, New Delhi, 1985.

2. Some books published by the Centre for Environment Education (CEE), Nehru Foundation for Development, Thaltej Tekra, Ahmedabad 380 054:

CEE and Vikram Sarabhai Community Science Centre, in collaboration with VIKSAT and Darpan Academy of Performing Arts for the National Council of Educational Research and Training: Joy of Learning: Handbook of Environmental Education Activities, Stds. 3 to 5, CEE, 1986.

Main Index

Mamata Pandya: Amazing Mammals (NatureScope-India), CEE, (no year)
Mamata Pandya: ABC ... Naturally, CEE, 1994.

3. Other books:

Swarn Khandpur: Let Us Know India, IBH, Bombay, 1976.
D.K. Barve: "Chimutai Chimutai Daar Ughad" (a fantasy on a crow and a sparrow, in Marathi), Dilipraj Prakashan, Pune, 1993.
The series of How and Why Wonder Books published by Transworld Publishers, 57-59 Uxbridge Road, London W5.

REFERENCE BOOKS FOR TEACHERS

1. Books published by the National Book Trust (NBT):

Many books are published by NBT under the series 'India - The Land and the People'. Some books useful for Units 1 and 2 are,

H. Santapau: Common Trees, NBT, New Delhi, 1966.
Salim Ali and Laeeq Futehally: Common Birds, NBT, New Delhi.
Harbans Singh: Domestic Animals, NBT, New Delhi.
Mary Chandy: Fishes, NBT, New Delhi.
M. S. Mani: Insects, NBT, New Delhi,
Bishwajit Chowdhary: Vegetables, NBT, New Delhi, Ninth Edition, 1996.
Ranjit Singh: Fruits, NBT, New Delhi, 1995.
K. T. Achaya: Everyday Indian Processed Foods, NBT, New Delhi.
S. K. Jain: Medicinal Plants, NBT, New Delhi.
J. S. Pruthi: Spices and Condiments, NBT, New Delhi.
K. T. Achaya: Your Food and You, NBT, New Delhi.

Other useful NBT books are,
M. S. Randhawa: Flowering Trees, NBT, New Delhi.

2. Books published by the Oxford University Press for Bombay Natural History Society (BNHS) and World-Wide Fund for Nature (WWF):

Gay, Kehimkar, Punetha, Common Butterflies of India (Nature Guides), WWF, Oxford University Press, Walton Street, Mumbai, 1992.
P. V. Bole and Yogini Vaghani, Field Guide to the Common Trees of India, WWF, Oxford University Press, Bombay, 1986.
Pippa Mukherjee, Common Trees of India (Nature Guide), WWF, Oxford University Press, Bombay, 1983.
Salim Ali: The Book of Indian Birds, 12th revised and enlarged centenary edition, Bombay Natural History Society, Oxford University Press, Mumbai, 1996.

3. Other books:

Chakravarti S. Venkatesh: Our Tree Neighbours, NCERT, New Delhi, 1976.
Sally Kneidel: Pet Bugs - A Kid's Guide to Catching and Keeping Touchable Insects, John Wiley and Sons, Inc. New York, 1994.
Allan Watson: Butterflies and Moths (The Nature Detective Guide Series), Macdonald and Co. (Publishers) Ltd., London, 1984.
Vidya Chintapalli: A Textbook of Nutrition, Discovery Publishing House, New Delhi, 1996.
Sumati Mudambi and M. V. Rajgopal: Fundamentals of Food and Nutrition, Wiley Eastern Ltd, New Delhi, 1996.

4. Some books on building materials:

Laurie Baker: Houses - How to Reduce Building Costs, Costford, Nirmiti Kendra Complex, Ayyathol, Trichur 680 003, 1986. (Hindi translation, 1991: 'Ghar - Keemat Kam Kaise Karen')

Roland Stulz and Kiran Mukerji: Appropriate Building Materials, SKAT (Swiss Center for Appropriate Technology, St. Gallen, Switzerland), 1988.
National Geographic Society: Animal Architects, NGS, Washington, D.C., 1987.
Karl von Frisch and Otto von Frisch: Animal Architecture, Hutchinson and Co., London, 1974.

Plan for the Small Science

(Primary Science)

CLASS III

Unit 1: The living world
Unit 2: Our body, our food
Unit 3: Measurement
Unit 4: Making houses

CLASS IV

Unit 1: Water and air (includes sanitation)
Unit 2: Sky and weather (with exploration of light & shadows)
Unit 3: Living and growing (includes food webs and reproduction)
Unit 4: Take care (safety)

CLASS V

Unit 1: Materials (properties, uses, conservation ideas)
Unit 2: Moving things (includes simple machines)
Unit 3: Life of all kinds (ecosystems and adaptations in India; seasonal cycles)
Unit 4: How our body works

Note: The topics begin with everyday experiences and immediate surroundings in Class III, moving gradually outwards. Classes IV and V make increasing use of measurement concepts. Some of the content of the present primary school curriculum is moved to middle school.

Main Index