JOY OF LEARNING

Handbook of Environmental Education Activities

Standard 6 to 8

Developed by

Centre for Environmental Education

and

Vikram A. Sarabhai Community Science Centre

in collaboration with

VIKSAT and Darpana Academy of Performing Arts

for the

National Council of Educational Research & Training (NCERT)

Centre for Environment Education
Nehru Foundation for Development
Thaltej Tekra, Ahmedabad – 380 054

Contents

Preface

Opportunities for learning exist everywhere. The Joy of Learning handbooks are an attempt at showing some ways in which these opportunities can be made use of. These books do not constitute a complete curriculum, nor do they cover all the different aspects that need to be dealt with at different levels in our education system. But each activity gives students an experience of a small part of the environment. And these small pieces of experience build into a larger mosaic of understanding. The activities have been selected from very different parts of the mosaic of environmental understanding to give a feeling for the tremendous variety of educational activities that can be carried out at the school level. We hope that these will provide a framework and approach that teachers can use to develop a number of activities based on their local environment and available opportunities.

The teacher is the key to the whole education system. It is only through the initiative and innovativeness of the teacher that any successful programme can be carried out. The format of the activities calls for a redefinition of what a school activity is and what the role of the teacher is. The teacher's role in these activities is not that of transferring information but rather one of being a facilitator, a leader and a resource person in a learning process that is participatory. No teacher can be expected to know all the answers, nor should it be required. On many occasions, the teacher will need to join the students in asking questions and getting the students to discuss how they will find the answers. It is also important to stress that all the "answers" are not yet known.

The activities have been developed to encourage students to observe and explore their environment; to understand relationships in nature, and between humans and nature; and to learn better how humans are an integral part of the intricate web of life. We believe that learning can be more fun, both for the student and the teacher, when based on real experiences.

Many schools in India may not have the resources and reference material to back such programmes. Attempts have therefore been made to keep the need for such material to the minimum.

The New Educational Policy has identified several thrust areas. In the field of Science these include Energy, Environment, Conservation, Wildlife Management, Social Forestry, Agriculture, Industry, Health, Nutrition, Food and Shelter. We felt that the way to introduce these subjects to students is through a Handbook of Activities and not by explicitly adding textbook contents covered by the thrust areas. The relevance of each activity to the particular thrust area has been indicated on each page.

While these activities are primarily to be covered in the Science class, many of them can be carried out in other subjects taught at school. This has been indicated with the respective activity.

While material requirements have been suggested with each activity, most of them can be done with alternative materials. The duration of each activity and the suitable time and season for it is also indicated.

For a handbook of this nature feedback is crucial. We therefore hope that you will try these activities and send us your feedback along with suggestions for improvement, as well as outlines of other activities that can be done.

We hope that these activities will lead to “Joy of Learning” a process in which both students and teachers enjoy exploring their environment together.

Kartikeya V. Sarabhai
Director, CEE

Acknowledgements

In India, national efforts are always overwhelming – especially when they are coupled with seemingly impossible deadlines and numbers. In 1986, the National Council of Educational Research and Training (NCERT), requested us to generate in ten days, activities which key persons and about five lakh teachers were to try out with lakhs of students over a period of three months. This task seemed staggering. But the importance of introducing an activity approach in schools and the urgency of creating environmental awareness encouraged us to accept the assignment. We felt we could contribute if only to the extent of getting the ball rolling by providing an approach and examples of activities that could be tried, discussed and improved upon.

There are groups all over India doing fascinating and innovative work in science and environmental education who, we know, could have greatly contributed to this effort. But there was no time to call people from elsewhere. In the limited time before us, we therefore, put together a team from the associated institutions of the Nehru Foundation for Development at Ahmedabad. The strategy was to develop as many new activities as possible based on the experience of the work done by the participating institutions. The programmes and publications of Vikram A. Sarabhai Community Science Centre, Centre for Health Education, Training and Nutrition Awareness (CHETNA) and CEE have proved helpful.

The importance of the task was known and felt by all. The team worked together from the word go. No one grudged working continuously till late at night nor working through Sundays and the festival of Holi. We would like to thank this entire team for its devotion born from a feeling that this effort may mark a step towards revamping the system of uncreative, submissive, rote learning of most of our schools today. We are thankful to the NCERT, New Delhi, for including us in this effort at reshaping education in India.

The project team

Most of the material for the Joy of Learning handbooks was developed and put together at a workshop jointly sponsored by the NCERT, New Delhi, and Centre for Environment Education, Ahmedabad, held at Sundarvan, Ahmedabad.

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ACTIVITY INDEX

BANANA BAIT	1
## Objectives To create a situation for the close observation of fruit bats. ## Activity Tell the students to hang some over-ripe bananas on a tree that is a few metres away from a closed glass window, preferably on the first or second floor. They should observe the bananas around dusk. If fruit bats are around, they are likely to get attracted and come to feed on these rotting bananas. Sometimes they come only on the second or the third day but the waiting adds to the excitement. The glass window offers an excellent viewing position for the students, for they can see bats in action only a short distance away. They may use a dim light when it gets dark. ## Variation / extension Let students observe the sky at dusk. Can they see bats flying? They may be able to spot bats of various sizes.	**Thrust area** Wildlife, Ecology **Subject** Science **Place** Home **Group size** 2 to 3 students **Duration** 3 - 4 days **Suitable time** Dusk **Materials** Bananas, String, Torch

WEB OF LIFE

2

Objectives

To demonstrate the interconnectedness of various elements in the environment.

Activity

Based on the list provided alongside, make a set of cards with the names of the animal /bird / plant / resource, etc. The children can illustrate these cards. There should be as many cards as there are children. Cards can be made of chart paper cut into rectangular pieces of about 5 x 8 cm. A safety pin can be put through the top of each card.

Make the students sit in a circle. Make sure to include and distribute cards depicting the four main elements of nature, 'Sun', 'Soil', 'Air' and 'Water'. Take a ball of string about 250 m long and give it to the Sun. It is appropriate to begin with the Sun because all life is made possible by it. Let the Sun, wind one end of the string around her finger and throw the ball to any aspect of nature she feels is related to her. For example, the 'Sun' may pass it on to 'Tree' because the 'Sun' gives energy to plants or trees. Let the student state the reason why she feels related to, this element. The 'Tree' then winds the string once or twice around his finger after ensuring that it is not loose between the 'Sun' and him. He then passes it to another aspect he feels related to, e.g., 'Fruit'. So the line of relationships continues as the string unwinds and begins to form a pattern which the students hold together. The ball of string is thus completely used.

Ask the students to see the web-like effect of the string. Then ask them to raise the web chest high. Let them hold it tightly so that if the web is pressed down it does not sag and touch the ground.

Ask the students to note this.

Ask the students what would happen if some of these elements were destroyed. Let the student representing these elements drop the string. Notice the visual effect. More elements may be dropped to dramatize the effect. Now press the web down. It would probably touch the ground because it is loose.

Ask the students what would happen if the Sun or the other three major elements of nature were disturbed. Conclude the game by explaining to the students how inter-relationships exist and why they are important.

Thrust area
Environment

Subject
Science, P.T.

Place
Outdoors

Group size
Entire class

Duration
45 minutes

Suitable time
Any time

Materials
Chart paper, colour pencils, scissors, a ball of string, safety pins.

1. Sun
2. Air
3. Water
4. Soil
5. Tree
6. Fruit
7. Parrot
8. Algae
9. Fish
10. Eagle
11. Turtle
12. Insect
13. Frog
14. Mosquito
15. Lizard
16. Leaf
17. Rat
18. Butterfly
19. Ant
20. Student
21. Grass
22. Dead leaf
23. Earthworm
24. Root
25. Shrub
26. Seed
27. Fungus
28. Dragonfly
29. Monkey
30. Spider
31. Snake
32. Mongoose
33. Kingfisher
34. Washerman
35. Woodcutter
36. Buffalo
37. Honey
38. Honeybee
39. Squirrel
40. Moss
41. Grasshopper
42. Plastic bag
43. Dead wood
44. Paper
45. Crocodile

YESTERDAY, TODAY, TOMORROW	3
Objectives To help students to understand environmental change over a long period of time. **Activity** Ask students to make a drawing of their school, neighbourhood, street or other area nearby, in such a way that a large scene is visible. They should take the drawing home and over the period of the next week, talk to people who can describe the same area as it was 20 or 30 years ago. They should prepare a second drawing based on these descriptions and bring both drawings to the class. In the classroom session, let each student put the pair of drawings up so that the class can see them. Let them discuss reasons for the changes—trees cut for wood, more houses built for more people, pucca roads, etc. Now get each student to draw a third drawing of what he would like the place to look like when he grows up. When the drawings are ready, each student should say how he thinks his 'dream' drawing can actually happen. What are the things that would need to be done to achieve it? **Variation / extension** If there are several students living in the same neighbourhood, they could work as a group. Discuss how some of the 'improvement' ideas that the students suggest may be carried out immediately, such as planting trees in the compound, removing garbage, etc. Ask the students which of the changes they consider to have been for the better and which for the worse. Can the students suggest (by hindsight) how the desirable changes could have been achieved without the undesirable consequences?	**Thrust area** Habitat **Subject** Social Studies **Place** Classroom, Outdoors, Home **Group size** Individual **Duration** One week, (including field trip 2 periods) **Suitable time** Any time **Materials** Paper, pencil, colours

ENERGY REPORT CARD

4

Objectives

To enable students to understand good and bad habits in relation to energy conservation.

Activity

Together with the students, compile a list of good habits with regard to energy conservation. Ask each student to make a list of these good habits and tell them to monitor their energy habits with the help of this. A sample is given below:

Energy Habit	Always Do	Sometime Do	Never Do
• Turn off the light when I leave the room • Turn off the fan when I leave the room • Walk to school • Close refrigerator door quickly • Cover vessel with a lid while cooking • Use mains rather than batteries			

Variation / extension

Discuss good habits for saving energy in the community.

Thrust area
Energy, Conservation

Subject
Science

Place
Home

Group size
Individual

Duration
One week

Suitable time
Any time

Materials
Large paper, pencil.

SEA TREASURES	5
## Objectives To learn about sea shells. ## Activity Take the students to a beach and let them collect shells they find lying around on the beach. Let them ensure that there are no animals living inside the shells. If there is any living creature in it, the shell should be returned to its original place. The collected shells should be carefully washed after soaking in water for a while. After drying, the shells should be grouped according to their shapes and forms. The live specimens at the beach should be observed as they move in the pools left by the tide amidst the rocks. Discuss what kind of animals live in these shells and how the shells help them. ## Variation / extension The students can use the shells as craft material and create various shapes and designs. They can stick the shells on paper to make a collage, or stick different shells together and form different animal shapes.	**Thrust area** Wildlife **Subject** Science, Craft **Place** Outdoors (seaside) **Group size** Entire class **Duration** 30 - 40 minutes for collecting **Suitable time** During low tide **Materials** Cardboard box, (shoe box), pencil, water bucket, gum, soft cloth, crayons, colour pencils, or paint.

FOOD FOR LIFE

6

Objectives

• To communicate the concept of predator and prey.
• To highlight the aspect of time stress in feeding.
• To highlight the situation in which the predator also becomes prey for another species.

Activity

Make two groups of at least 10 students each. The members of the two groups are identified by tying ribbons of two different colours around their wrists. Draw two lines 50 metres apart and let each group stand, side by side behind each line. In the centre is a feeding circle of about 5 m diameter. 50 matchsticks (5 matchsticks per member) are spread in this circle.

Students of one team are designated frogs, while students of the other team are snakes. At the first call or whistle, the frogs come to feed on the matchsticks. Each frog must collect as many insects (matchsticks) as possible. After 15 seconds or so, the second call or whistle releases the snakes to hunt their food (frogs). The frogs try to escape back to the safety of their 'home'. Any frog caught on the way is out. Blow the whistle again after 15 seconds.

Frogs with less than three matchstick insects die of hunger and are 'out.' Snakes who have not caught any frogs are 'out.'

Continue the game for one more round. Now form a third team of eagles from members who are 'out.' Start the game with the frogs feeding. Quickly release the snakes and then the eagles which eat snakes.

Variation / extension

The time intervals between calls may be varied to introduce the concept of stress or safety. A fourth group of hunters may be added.

Thrust area
Ecology

Subject
Science

Place
Outdoors

Group size
Two groups of 10 students each

Duration
45 minutes

Suitable time
Any time

Materials
Matchsticks, Ribbons of two colours.

FOOD FIND

7

Objectives

To demonstrate the importance of camouflage in nature.

Activity

Colour a large number of toothpicks or matchsticks with five different colours. Use red, brown, green, blue and yellow.

Select a 10 m x 10 m area in the school compound, having some grass cover.

Take four toothpicks of each colour per student i.e. 20 toothpicks per student.

Mix and sprinkle these over the selected area.

Take 20 or less students from a class and divide them into two groups 'A' and 'B.' Tell them that they are about to play a simple game. The students are birds, and the toothpicks are insects of different colours spread out in the field. Show samples of different coloured toothpicks to the students.

Tell them that each team member must pick up five insects in a short time period alloted. There will be four rounds for each team. If a member does not pick up five toothpicks in the allotted time, then he is 'dead' and must leave the game.

When you blow the whistle, group A should run into the marked area and start picking up the sticks. Within 15 seconds, blow the whistle again. Group A should come out and hand the sticks to you. Put these aside. Blow the whistle for team B to go in. Continue till 3-4 rounds are over and you have 6-8 heaps of identified toothpicks.

Count the number of toothpicks of each colour collected by students in each round and enter it in a table like the one given below:

	Round I		Round II		Round III		Total	
	A	B	A	B	A	B	A	B
Red insects								
Brown insects								
Green insects								
Blue insects								
Yellow insects								
No. of birds alive								

Thrust area
Environment

Subject
Science

Place
Outdoors

Group size
20 students

Duration
35 minutes

Suitable time
Any time

Materials
400 toothpicks / matchsticks of red, brown, green, blue and yellow colours paper, pencil.

On the basis of the table, discuss the following : Sticks of which colour were picked up in the greatest number during the first round ? Why ? Sticks of which colour were picked up in the least number during the first round ? Why ? Study the table and find out how many insects of each colour remain in the field. How is this game similar to processes in the living world ? In what ways is colour important in the natural world ? Variation / extension Coloured cardboard can be punched with a punching machine to obtain small circles of different colours. These may be left on dark backgrounds of different colours, i.e. on a table, and the game played indoors.	

PAINTINGS ON THE WALL	8
Objectives To encourage students to practice a traditional art form. **Activity** Explain to students that since time immemorial wall paintings have been a way of folk expression. Even today, walls are painted or decorated with traditional motifs in many parts of the country. Then, if possible, give the students a whole wall to paint on. If this is not possible, a really large piece of paper can be pinned on to the wall (4-5 sheets of newspapers can be stuck together to form a large sheet). Let the students paint on this. Murals should be encouraged and traditional methods may be used, such as painting with a twig, or chalk, or the fingers, to create free patterns. Students could also try painting on mudplaster. The mudplaster can be made by mixing mud, cowdung and rice husks together. This mixture should be plastered on a wall. The students can make patterns on the wall or embed other material on the wall, or paint on it when it is dry. Let them paint from the life around them, or from stories they have heard, or from their own imagination. **Variation / extension** They should collect and draw *alpana*, *kolam* or *rangoli* on any floor surface. Various wall painting techniques from different parts of India should be shown to them.	**Thrust area** Environment **Subject** Art / Craft **Place** Classroom, Home **Group size** Individual **Duration** One hour **Suitable time** Any time **Materials** Paper, brush, paints, crayons or chalks, mud, cow-dung, rice, husk, coloured powder.

A NORMAL CURVE

9

Objectives

To develop appreciation of the fact that in a homogeneous population, the majority falls in the average class.

Activity

Divide the students into four or five groups.

Ask each group to collect at random about 40-50 fallen, undamaged leaves from any one type of tree. Let them clip the stalks of the leaves. Let the students record in millimetres the length of each leaf measured along its central vein.

Pool the data thus recorded by all the groups and tabulate it, giving the number of leaves in each length or length class, e.g. 10-14 mm, 15-19 mm, 20-24 mm, and so on.

Ask the students to identify:

• What are the lengths of the shortest and the longest leaves?

• What is the average length of the leaves?

• In which length class are the maximum number of leaves?

• How many classes are there above and below this class?

Variation / extension

Ask the students to plot a graph of the length classes of leaves versus the number of leaves in each class, and to join with a smooth curve the points which they have plotted. They can repeat this exercise with leaves from different types of trees.

Record in centimetres the heights of all the students in the class and ask them to do a similar exercise with the data.

Ask the students to comment on the shapes of the curves they have drawn and on the similarities between them.

Thrust area
Environment

Subject
Maths

Place
Classroom, Outdoors

Group size
Entire class

Duration
30 - 45 minutes

Suitable time
When trees shed leaves

Materials
A measuring scale graduated in mm / cm, paper, pencil, graph paper.

SEED TO SEED

10

Objectives

To develop skills of observation and information-gathering by collecting information about farms and crops.

Activity

Take the students to nearby farms in different agricultural seasons. Let the students observe each farm and what is growing on it. They should try and collect as much information as possible by talking to the farmer / owner. This information would include:

- What is the crop that is planted?
- Why is a particular crop planted?
- What else could have been planted?
- When is the crop planted (season, months, etc.)?
- What preparations are necessary before planting the crop?
- What is the crop used as (cereal, fodder, oilseed, etc.)?
- Where are the seeds obtained from?
- What part of the crop is useful?
- What do the farmers do with the remaining parts of the plant?
- Where does the water needed for the crop come from?
- What fertilizers are used (natural or chemical), and how often?
- What are the crop's major pests?
- What pesticides are used? Is any other method of pest control used?
- When is the crop harvested?
- How much yield is expected per hectare or part thereof?

Students should find out the complete cycle, from seed to seed, of the crop.

Variation / extension

The complete cycle of the crop from seed to seed may be shown as a chart with samples (or appropriate sketches or pictures) and displayed in the school for the benefit of other students.

Other crops may be studied in the same way. Problems of chemical fertilizers and pesticides may be discussed.

Thrust area
Agriculture

Subject
Science,
Social Studies

Place
Outdoors
(farms and fields)

Group size
Group of 5 to 6
Students

Duration
Half a day,
twice a year

Suitable time
Whenever farming activities take place

Materials
Notebook, pencil

GETTING THERE

11

Objectives

To understand two basic elements of navigation, namely direction and distance.

Activity

Assemble the students in a large field or playground, in which they cannot easily relate to any landmarks nearby.

Call one student to the centre of the field. Place under her foot, a small flat object such as a stone or a fragment of coconut shell or any other similar object which is not easily visible from a distance. Ask the student to walk, with an even tread, 25-30 steps away from the object, in a straight line. Then ask her to turn at right angles and again walk the same number of steps. Let her repeat this process until she completes a square.

Let each student do this activity. How many of them finish exactly where they started?

Explain to the students how accuracy of direction and measuring of distance are important in navigation.

If a compass is available, try this activity by using it to turn at right angles.

Variation / extension

Let the students try doing the activity blindfolded.

Let a student describe to another student how to get from the school entrance to any given place in terms of number of steps, number and direction of turns. No landmarks should be mentioned. Let the other student try to reach the place following the information given.

Evaluation

Ask the students to identify the causes of error in reaching their destination, and let them practise reducing the error by gaining a precise sense of direction and consistency of stride.

Thrust area
Environment

Subject
Maths, P.T.

Place
Outdoors

Group size
2 to 5 students

Duration
30 minutes

Suitable time
Any time

Materials
A small stone, magnetic compass (optional).

FAMILY MAP

12

Objectives

• To develop map reading ability.
• To identify places of interaction of family members.

Activity

Obtain a map of your city/town/village from available sources such as books, municipal office or village panchayat. Ask each student to make a tracing of the map. The map should have the names of the main settlement areas and other important common facilities and places in the settlement.

Now let the students independently identify their residential area.

In particular, let them find the location of their house and mark the area with a pencil.

Then they should be asked to indicate the location of the school, parent's work places, local shopping areas, play and recreational areas, places where their friends and relatives live. They should mark all these places and then draw lines between the identified areas and their house.

Now let them look at the map and identify various areas where their family members are carrying out activities. Let them find the areas in the settlements where the family members have no contact.

Evaluation

Discuss the factors responsible for settlement of a family in one area. What makes an individual keep his/her association with the settlement?

Thrust areas
Population, Habitat

Subject
Social Studies

Place
Classroom

Group size
Individual

Duration
1 hour

Suitable time
Any time

Materials
Map of city / town / village, tracing paper, pencil

Prerequisites Assumed
Availability of map of a settlement.

SOLAR PURIFIER	13
Objectives To show how pure water can be obtained from impure water by using solar energy. **Activity** Put some water in a glass or metal dish and place it in the sunlight. Add a few drops of black ink to the water. Cover the dish with a transparent glass or polythene sheet. Leave it in the sunlight for 15-20 minutes. You will see droplets of water condensing on the inner surface of the glass or sheet. Ask the students to note the colour of the condensed water drops. They may taste these water drops. Repeat the experiment using salt water. Does the condensed water taste salty? **Variation / extension** Ask students how they will obtain drinking water from sea water. **Evaluation** How do evaporation and condensation take place in this activity? Is the formation of droplets of water on the glass sheet related to formation of clouds?	**Thrust area** Energy **Subject** Science **Place** Classroom, Home **Group size** Individual **Duration** 45 minutes **Suitable time** Sunny day **Materials** Glass or metal dish, water, black ink, transparent glass or polythene sheet.

KEEP THE COCONUT	14
Objectives To understand that moisture is important for the growth of micro-organisms and that removal of moisture helps preserve food items. **Activity** Take a coconut and split it into two. Ask the students to heat one of the pieces of the coconut with the shell on. Ask them to hold the edible part of the coconut over a mild flame. Let them evaporate the water, taking care not to char the coconut. Now let them place both the pieces in an undisturbed area. After allowing the pieces to remain as they are for a few days, ask the students to observe both the pieces for any mould-like growth. Ask them why there is no such growth on the piece that was heated. **Variation / extension** Ask students to find out what food materials are preserved through drying.	**Thrust area** Agriculture **Subject** Science **Place** Classroom, Home **Group size** Individual **Duration** One week **Suitable time** Any time **Materials** A candle, a matchbox, a coconut

ATTRACT THE ANTS

15

Objectives

• To learn about the behaviour of ants.
• To develop observation skills.

Activity

Ask the students to place a piece of *chapati*, bread or something sweet like jaggery, moistened sugar, or honey, on a clean patch of ground where they see no animal life.

Let them observe the area around the food and note down their observations.

How long does it take for ants to arrive? Does one ant find the food or do a lot of ants arrive together? Do they head straight for the food or is it found after the area is searched for a while? How many ants collect around the food? Can the students tell where the ants are coming from? How does the ant which has found the food tell the rest of ants where it is? Is there any pattern in the ants' movements?

Ask the students to observe whether the ants eat the food where they find it, or whether they carry it away. Have they ever seen an ant carrying a dead insect or a piece of bread much larger than itself?

How long does it take the ants to remove all the food? How do the ants find their way back to the nest?

Variation / extension

Ants can also be observed in the home, on trees, near vegetation, etc.

Evaluation

Ask the students to find out names of other animals which live in a group and are involved in group interactions.

Thrust area
Ecology

Subject
Science

Place
Classroom, Home, Outdoors

Group size
Individual or 5 to 10 students

Duration
15 - 60 minutes

Suitable time
Any time (except in very cold weather)

Materials
Chapati, bread or jaggery.

THE POET IN US	16
Objectives To enable students to identify themselves with a natural object and to express themselves in writing. **Activity** Ask each student to choose an element in nature (such as sun, soil, air, cloud, tree, grass, butterfly, sparrow, tiger, water, river, fish, etc.) which she feels close to, because it reflects her own personality or qualities. Students may then be asked to speak on how the chosen object reflects their personality. Let the students then take up their papers and pencils and: • in the first line, write the name of the chosen element (subject / noun) • in the second line, write two words describing its qualities (adjectives) • in the third line, write three words of action about the element i.e. what that object does (verbs) • in the fourth line, write four words describing how they feel about the element (phrase, sentence, expression) • in the fifth and last line, write a word to replace the first noun (synonym). Now let each student read out what she has written like a poem or song. Here is an example. Butterfly Delicate, graceful Flutters, finds, sips Seems weak but isn't Beauty This exercise can be done in any language.	**Thrust area** Environment **Subject** Science, Language **Place** Anywhere **Group size** Individual **Duration** 30 minutes **Suitable time** Any time **Materials** Paper and pencil.

EVERY DROP COUNTS

17

Objectives

To explain the importance of preventing water wastage.

Activity

Gather the students around a water tap. Place a bucket under the tap and adjust the tap so that the water drips drop by drop.

Let one student take charge of the stopwatch or minute glass and be the time keeper. Ask another student to hold a measuring cylinder under the dripping tap. As soon as the time keeper gives a signal at the end of one minute the cylinder should be removed from under the tap. The water collected in the cylinder should be measured. Based on the amount of water collected in one minute, ask the students to calculate the amount of water that would be wasted in one hour or in a day from the dripping tap.

You could lead a discussion on the most common causes of water wastage in our homes, schools, offices, etc. and on methods of preventing water wastage.

Variation / extension

Information could be collected on how much water is used everyday for brushing, bathing, cleaning, washing clothes, etc. This could be compared to the amount of water wasted from a dripping tap in a day.

Thrust area
Conservation

Subject
Science, Maths

Place
Home, School

Group size
Individual

Duration
10 - 15 minutes

Suitable time
Any time when the school is in session

Materials
Measuring cylinder or empty soft drink bottle of known volume, stop watch, or ‘minute’ glass, a tap or a large bucket with an attached tap, a bucket.

FEEL OF THE EARTH

18

Objectives
To make children aware about the usefulness and sensitivity of the feet.

Activity
Ask the students to walk barefoot in the school playground. Then ask them to walk in circles, and then to rotate at one spot on their feet.

Next let them walk on tip toes, on heels, and then backwards on their heels. Discuss which part of the feet are most sensitive. The students may be told the story of the heel of Achilles or Krishna.

Outside, in an open area, make the students press the earth with their feet. Let them feel the wet earth, the grass and the stones with their feet. Let them express their feelings after touching things with their feet.

Ask them to think of the uses of their feet. Explain why the washing of feet is necessary. Discuss why we touch the feet of those we respect.

Variation / extension
To discuss the use of feet in dance.

Evaluation
Students should be able to write an essay on feet.

Thrust area
Health

Subject
P.T.

Place
Outdoors

Group size
Entire class

Duration
One hour

Suitable time
Any time

Materials
None.

SURVEY OF LAND USE

19

Objectives

To enable students to identify how land is used in their surroundings.

Activity

Discuss with the students different purposes for which land is used: for agriculture, for building houses, for building factories, offices, etc; for building roads, for forests, as a habitat for animals, etc.

Take the students for a walk in the neighbourhood areas around the school. Ask them to carefully observe how the land is used in that particular area. Ask them to record their observations.

After the observations, ask the students to classify their observations in terms of rough percentage in different categories, e.g.:

- Land utilized for human habitation
- Land utilized for agriculture
- Land used for transportation
- Land utilized for commercial purposes (shops, offices, etc.)
- Land not utilized for any purpose by humans.

Ask the students to visit the area again and interview some elders living in the area. You may help them to put together a list of questions to be asked. For example:

How long has a particular piece of land been under this use? Do they know why the use changed?

Do they feel the change is for better or worse?

Groups of five students can perform the task of interviewing one elder and recording the answers.

Evaluation

You could generate a discussion on changing land-use patterns, based on the interviews.

Thrust area
Environment

Subject
Science,
Social Studies

Place
Outdoors

Group size
5 to 6 students

Duration
3 - 4 hours

Suitable time
Any time

Materials
Paper, pencil.

COOL IT	20
## Objectives To familiarize students with the method of food preservation by cooling. ## Activity Ask students to take some fresh green vegetables, e.g. cucumber, spinach, etc. Let them divide the vegetables into two parts and put them in two metal containers and cover them. Then they should put one container inside an earthenware pot or matka in which there is some water. Ask them to make sure that the water does not enter the metal container. Let them cover the pot with a damp cloth. They should leave the other metal container as it is. Ask them to place both the matka and the container in the shade. After 2-3 days students should examine the vegetables in the two containers, and note the difference. Discuss with students the role of cooling in the preservation of food articles and how this principle is applied in refrigeration.	**Thrust area** Agriculture **Subject** Science **Place** Classroom, Home **Group size** Individual or entire class **Duration** 2 - 3 days **Suitable time** Summer **Materials** An earthenware pot or matka (with a wide mouth), two metal containers with lids, fresh green vegetables, a piece of cloth.

TIME CHART

21

Objectives

To make students aware of how they spend a day.

Activity

Choose a weekday during the school term. Ask the students to keep detailed records of how much time they spend on each of their activities during the course of the day, from the time they get up, till they go to bed at night.

They should make a chart listing all their activities and the time spent on each. Based on this, let them make a pie chart. They should colour or pattern the segments, using different colours or patterns for each activity.

Students should bring their respective charts to school the next day and these could be displayed and compared.

You could lead a discussion stating the advantages of a healthy lifestyle-when enough time is given to sleeping, physical activity, having meals, studying, etc.

Students could try to work out an ideal or balanced time chart.

Variation / extension

Collect similar data for each member of the family.

In areas where firewood has to be collected, you could point out the time spent on gathering fuel for cooking and discuss how this time could be saved.

Thrust area
Environment

Subject
Social Studies, Maths

Place
Home

Group size
Individual

Duration
2-3 days

Suitable time
Any time when the school is in session

Materials
Paper, pencil, geometry box, clock, colour pencils.

SEED BANK	22
## Objectives To familiarize students with the large variety of seeds. ## Activity Ask the students to collect different types of seeds (fruits, flowers, vegetables as well as cereals, pulses, etc.). These could be collected from home gardens, nurseries or plantations. Ask the students to observe, study and classify the seeds according to shape, size, colour and the location from where the seeds were collected. Initiate a discussion on the ways in which the classification can be done. Students could create a “display corner” of the seeds after they properly classify and catalogue them. You could ask the students to exchange seeds or give them to people who want to raise plants/trees from them. ## Variation / extension Ask the students to collect few seeds of each variety and divide them into two parts. Drop one part into a container with clean, cool water. This should be kept undisturbed for four hours. The soaked seeds should be compared with the dry seeds. Observe that the seeds will be bigger and the seed coat may be wrinkled or broken. Discuss the reasons. Ask the students to sow some of the seeds in small suitable containers with soil in the classroom itself. Observe the seed germination. Compare how different seeds germinate (e.g. time taken by different varieties of seeds to germinate), how the leaves and the roots develop, etc.	**Thrust area** Agriculture **Subject** Science **Place** Outdoors, Indoors **Group size** Entire class **Duration** One hour **Suitable time** Any time **Materials** None

PERSONAL MEASURES

23

Objectives

To demonstrate that it is possible to obtain fairly reliable approximations of length and distance using our own limbs as units of measurement.

Activity

Ask each student to measure with a ruler the dimensions (in cm) of the following:

- The width of her index finger and middle finger placed together.
- The distance between her elbow and the tip of her middle finger when the hand is resting flat on any surface.
- The distance between the tips of the middle fingers of her left and right hands when she stands with her arms outstretched at shoulder level.
- The distance she covers in each step when walking normally (a "pace"). To measure this, ask the student to walk a number of steps, measure the distance between the starting and finishing points, and divide it by the number of steps walked. Ask her to traverse the same distance a number of times to see if there is any variation.

Now ask each student to measure various objects and distances using these personalized units. Let them check their results by measuring the same objects and distances with standard rulers or tapes. Explain how, until the invention of the standard metric units of measurement in use today, a lot of traditional units of measurement were based on human dimensions.

Variation / extension

Form a group of students of identical height in the class. Get them to compare their personal units of measurement with each other. Ask them to comment on the similarities and differences.

Evaluation

Ask the students why they think bricks that have been used over thousands of years, in places thousands of kilometers apart, vary only nominally in length and breadth irrespective of the place and the time to which they belong.

Thrust area
Environment

Subject
Science, Maths

Place
Classroom, Outdoors

Group size
2 to 3 students

Duration
30 - 45 minutes

Suitable time
Any time

Materials
A ruler or measuring tape graduated in metric units, sheet of paper, pencil.

A DROP OF WATER

24

Objectives

To demonstrate to students the distribution of water on earth

Activity

Divide the class into small groups. Ask each group to measure 2200 ml of water into a container. If a measuring cylinder is not available, an empty soft drink bottle of 300 ml capacity may be used. Tell them to assume that 2200 ml represents the total water available on earth.

Ask them to take a teaspoon and measure out 12 spoonfuls of water into a small transparent container. Tell them that this is the total amount of fresh water on the earth, including the water found in lakes, rivers, ice-caps, and as groundwater. The water that remains in the large container represents salty water found in oceans and seas. From the container with 12 spoonfuls of water, let the students measure out two spoonfuls into a dish. This represents the groundwater. Let the students take another dish and remove into it half-a-spoon of water from the container which now has 10 spoonfuls of water. This represents the water found on the surface of the earth in freshwater lakes. From the remaining water in the smaller container, let the students remove one drop using an ink-dropper. This drop represents the amount of water found in rivers. The smaller container will now have about nine spoonfuls of water left in it. Tell the students that this represents the amount stored in ice-caps.

Ask the students to compare the quantities of water in the various containers.

Evaluation

Ask the students how the fresh water stored as ice becomes available to us.

Ask how people use sea water and whether it can be converted to fresh water for our use.

Distribution of water on earth in %	
Oceans	97.2
Ice-caps	02.0
Groundwater	00.62
Fresh water lakes	00.009
Inland seas and salt lakes	00.008
Atmosphere	00.001
Rivers	00.0001
Total	99.8381

Thrust area
Environment

Subject
Social Studies

Place
Classroom

Group size
Group of 10 Students

Duration
45 minutes

Suitable time
Any time

Materials
Large container (2.5 litre volume) small transparent container, two small dishes, measuring cylinder, teaspoon, ink-dropper.

LIGHT FOR HEAT

25

Objectives

- To demonstrate the heating effect of sunlight.
- To demonstrate its potential as an alternate source of energy.

Activity

Take two identical containers-tin cans or small mugs-with large mouths. Fill both the containers with equal amounts of water.

Measure the temperature of water in both containers with a $0^{o}C$ to $100^{o}C$ thermometer. Keep one container in sunlight and the other in the shade. Measure the temperature of water in both containers after one hour.

If thermometers are not available, feel the difference in temperature by touching the water in both the containers.

Paint the inside of one container black with the help of a water insoluble paint or tar. Fill both the containers with the same amount of water and keep them both in the sun. Measure the temperature of water in both the containers after one hour.
Which has warmer water? Why?

Evaluation

Discuss the use of sun's energy for cooking.

Thrust area
Energy

Subject
Science

Place
Outdoors, Indoors

Group size
Entire class

Duration
30 minutes each on 2 days

Suitable time
Summer

Materials
Two identical containers, water insoluble black paint or tar and a thermometer.

HOME FOR A BIRD

26

Objectives

• To encourage students to attract birds to nest where they can be observed.
• To observe how birds make their nests and how they rear their young

Activity

Let the students experiment with different types of nest-boxes to try and attract sparrows to nest in them. A *matka* could be used by covering the mouth so that large birds or cats cannot enter, and making a small hole on one side. The hole could be 5 - 6 cm in diameter. If a box is being used, only one small opening should be kept.

The *matka* or the box should be hung in one corner of a room near an open window or a door.

Once the sparrow is attracted to the *matka* or box, and begins building the nest, students should observe carefully and make notes. They should note the following:

• Does the male or the female make the nest?
• What materials does the bird use to make the nest?
• Where does it bring these materials from?
• How many times in an hour does the bird come to the nest?
• How much time does the bird take to complete its nest?
• Can each one guess on which day the bird laid its eggs?
• How many days after the completion of the nest was the cheeping of the baby birds heard?
• What is the difference between the baby bird's cheep and the parent bird's call?
• Who takes more care of the babies-the mother or the father?
• What do the parents feed the babies with?
• How many times in an hour do they feed the babies?
• Where do they get this food from?
• After how many days do the babies start flying?
• How do they learn to fly?
• Once they leave the nest, do the parents and the babies come back to the nest?
• How long does it take, from the time the bird started building the nest till the babies fly out of it?

Thrust area
Wildlife, Habitat

Subject
Science, Craft

Place
Classroom, Home

Group size
Individual, 3 to 4 Students

Duration
About one month

Suitable time
Nesting season

Materials
An old matka (small)
or a used cardboard box (35cm x 25cm x 15cm approximately)
or any other suitable container.

Once the students are sure that the birds are not coming back, they could take out all the nest materials and examine them. Let them find out what materials were used, and in what quantities. While the eggs and the babies are in the nest, care should be taken not to disturb them. Explain to the students why they should maintain a distance from the nest. Evaluation Students can read out their reports and compare their observations.	

KEEP IT HOT

27

Objectives

To show how heat energy can be stored or conserved by using insulators.

Activity

Boil water and fill two metal tumblers with it. Let the students record the temperature in each tumbler with the help of a thermometer. Cover the tumblers with lids. Put one tumbler inside a cardboard box lined with old rags. The other one should be left as it is.

After 15 minutes, let the students record the temperature of water in both the tumblers. Is there any difference in the temperature readings between the two tumblers?

Repeat the experiment using boxes lined with different materials like straw, thermocole, etc. Let them also try the experiment with a box with no lining. Note the differences in temperature readings. Which of the materials are good insulators? Engage students in a discussion on how important insulators are in conserving heat energy.

Variation / extension

Ask students why we wear woollen or heavy cotton clothes, and use blankets or quilts in winter. Discuss how animals keep warm in cold conditions.

Thrust area
Energy

Subject
Science

Place
Classroom

Group size
Individual or
2 to 3 students

Duration
One hour

Suitable time
Any time

Materials
Two metal tumblers,
lids for the tumblers,
a thick cardboard box, rags, straw, paper, two laboratory thermometers,
water,
stove, vessels for boiling water.

BARK AUTOGRAPHS

28

Objectives

• To learn that different trees have distinctive bark characteristics.
• To use the senses of smell, touch, as well as observation, to study trees.

Activity

Take the students to a place where a variety of trees is growing. Let each student select a different tree.

Ask the students to feel the barks of different trees with their hands and note the differences. Barks of certain trees have characteristic smells and these may also help to differentiate between them. Ask the students to describe the smell of each bark, if any. It is not necessary to know the names of the trees in the beginning.

Now tell the students to place a sheet of blank paper on the bark, hold it with one hand and rub a soft pencil or a crayon on it with the other. The pattern of the bark will emerge clearly on the paper.

Ask the students to compare two or more prints prepared by them and note the differences. Let them find out the names of the trees.

Let them observe prints made by their friends to find out if they can name the trees.

Thrust area
Environment, Forestry

Subject
Science, Craft

Place
Outdoor where there are several trees

Group size
Individual

Duration
An hour or two

Suitable time
Any time

Materials
Paper, crayons

Recommended trees
Mango, Neem, Sissoo, Babul, Pipal, Palm or such other common trees.

HOW MANY PEOPLE?

29

Objectives

To learn about the population density in a colony / locality.

Activity

Ask the students to select two localities or colonies near the school. Let them find out the total number of houses in each area.

Now ask the students to randomly select about ten per cent of houses for counting residents.

They can find out the number of residents in the selected houses by visiting them and talking to the people. Let them total the numbers.

Now let them calculate the average population of the locality by this formula:

$$\text{Population of locality} = \frac{\text{Total no. of houses} \times \text{Population of selected houses}}{\text{Number of houses counted}}$$

If the area, in hectares, of the locality can be found out from the local civic authority, students can calculate the population density. Otherwise this will have to be approximated.

$$\text{Population Density} = \frac{\text{Population of locality}}{\text{Area of locality in hectares}}$$

Let them repeat the exercise for the other areas.

Now let the students compare the population density of the two localities. What could be the reasons for differences in population density?

Thrust area
Population

Subject
Social Studies, Maths

Place
Outdoors

Group size
Entire class

Duration
One day

Suitable time
Any time

Materials
Paper, pencil

WHAT'S THE NEWS ?

30

Objectives
To make a scrapbook of news items related to the environment.

Activity
Ask students to start a scrapbook of clippings from local newspapers on reports relating to environmental issues.

Set a time period of one month to prepare the scrapbook.

Instruct students on how to maintain a scrapbook. Each report should be pasted neatly on a separate page. The name of the newspaper and the date of the report should be neatly written on the page. The book could be organized into sections such as wildlife, health, pollution, weather, population, natural disasters, etc. The scrapbook should be neatly covered and labeled.

Scrapbooks could be exchanged. A display of the scrapbooks could be arranged.

Variation / extension
Groups of students may be assigned different topics for their scrapbooks.

The students may be asked to bring clippings to the classroom to display these on the notice-board before pasting in the scrapbook. The clippings may be pinned to a notice board with a map of India. The area in the news may be denoted by a thumb pin with a coloured head.

Evaluation
Weekly discussions by students may be organized to discuss the newspaper reports.

Thrust area
Environment

Subject
Science, Language

Place
Classroom, Home

Group size
Individual or in groups

Duration
Over a month

Suitable time
Any time

Materials
Scrapbook, scissors, gum, daily newspapers.

MOSQUITO MEAL

31

Objectives

To demonstrate the role of fish in controlling mosquitoes.

Activity

Set up two aquarium tanks. Fill both with clean water. Set up one of the aquaria with a few fish, e.g., guppies. Leave both the tanks undisturbed outdoors in the shade.

Mosquitoes will lay their eggs in the tanks and these can be seen on the surface. Once the eggs are laid, these will hatch into larvae in about 2 days. Ask the students to observe the two tanks at regular intervals. When the larvae are seen, students should cover both the tanks with a mosquito net to trap the adult mosquitoes so that they can be observed later. Discuss with the students the role fish play in controlling mosquito populations and how this can be applied. Explain how polluted water (where fish cannot easily exist) enables mosquitoes to breed freely.

Variation / extension

Let students walk around the school to make a list of large as well as small water bodies which seem to be breeding mosquitoes and those which do not.

In the school where students come from different parts of the city, ask whether students have observed mosquitoes in their residential areas. From those students whose areas have many mosquitoes, find out whether there are ponds of stagnant water nearby.

Thrust area
Health, Ecology

Subject
Science

Place
Outdoors

Group size
Entire class

Duration
One week

Suitable time
Monsoon

Materials
Two aquarium tanks,
clean water, water from the gutter,
fish, mosquito nets.

FIELD OF VISION

32

Objectives

To understand how lizards catch their food.

Activity

Ask the students to observe a lizard in their homes.

The next day, ask the students to describe how the lizard finds insects. Tell them to do the following experiment that day.

Let them take a small reflective surface, e.g. the glass of a watch or small mirror. They should find a light source (even sunlight coming in at the correct angle will do), and reflect the light close to the lizard. Let them keep the reflection moving as if a moth is flying around. The lizard will notice the movements when it comes within the range of its vision.

Ask students to observe what the lizard does. Does it try to catch the reflection? Why?

Thrust area
Wildlife

Subject
Science

Place
Home

Group size
Individual

Duration
30 minutes

Suitable time
Any time

Materials
Watch or tiny piece of glass or mirror, source of light.

WATER WAYS	33
## Objectives To find out how various factors related to domestic water use have changed over three generations. ## Activity Ask the students to make a chart similar to the one given, with relevant additions or deletions. Ask them to interview a grandparent (or any person of around 50 years in the neighbourhood), and a parent, with the help of these charts. The information gathered should be about the condition when the grandparents and parents were of the student's age. After the interview, let the students fill out the chart for themselves. Students may be given two days to finish this exercise. ## Evaluation The class may discuss whether they think water is more easily accessible now or in the past, whether any new uses of water have come up, whether we use more water in our homes today than our parents or grandparents did, what effect present-day habits (use of soap, detergent, etc.), have on water quality as compared to past habits. What are the implications of changing habits on sewage, waste treatment and waste disposal.	**Thrust area** Environment **Subject** Social Studies **Place** Home **Group size** Individual **Duration** Variable **Suitable time** Any time **Materials** Paper and pencil.

Water Use Chart

	Grandparent	Parent	Me
• How did you clean your teeth? (toothpaste, datun, etc.)			
• Where did you bathe? (At the river, tank, home)			
• What did you use as a cleaning agent? (soap, besan, etc.)			
• What was the source of water for the house? (river, community well, house well, taps, etc.)			
• How far was the water source from the house?			
• Who collected the water?			
• Where were the clothes washed?			
• With what were the clothes washed?			
• What kind of toilets did you have? (dry latrines, flush, etc.)			
• Was there ever a water shortage in your town/village?			

CLEAN ART

34

Objectives

• To instill a sense of cleanliness in students.
• To encourage creative and artistic skills.

Activity

Divide the students into four or five groups. Tell them that each group is going to make a dustbin.

Ask the students to collect a used drum from a factory or a home, or buy it from a *kabadi* market. An old oil or kerosene tin will also do.

The top part should be taken off by a metal worker and sharp edges removed. Ask the students to clean the drum or tin thoroughly with soap and water, and dry it.

Ask the students to paint or decorate the drum by using their creative and artistic skills. They may draw cartoons or create attractive designs.

Ask them to place the colourful dustbins at various locations in the school where they may be needed. The best dustbin may be awarded a prize.

The most important aspect of this activity is instructing all the other students in the school to use the dustbin for depositing waste.

The class involved in making the dustbins may also plan and carry out an awareness campaign for this.

Variation / extension

The students may make dustbins for their homes or neighbourhood and ask people to use them.

Evaluation

Ask students to note whether the school premises are cleaner after installation of dustbins.

Thrust area
Health, Environment

Subject
Science, Craft, Civics

Place
School

Group size
Groups of 8 to 10

Duration
1 or 2 days

Suitable time
Any time

Materials
Drum or tin, paint, brush.

TRAP THE HEAT

35

Objectives
To demonstrate how solar energy can be converted to heat energy.

Activity
Take a wooden or cardboard box of any available size. Let the students paint the inside of the box black. Place the box in the sunlight. Put a 0^{o} C to 110^{o}C thermometer inside the box and ask the students to note the temperature readings.

Cover the box with a transparent glass sheet. Keep it in sunlight for half-an-hour. Now let the students record the temperature of air inside the box. Ask students to take temperature readings at 30 minute intervals for 2 hours.

Explain to the students that the device acts as a heat trap. The black surface absorbs light and gives out heat. The glass sheet kept above the box reflects the heat back into the box. The heat gets accumulated in the box.

Explain to the students that the temperature inside the box would not rise indefinitely. With increasing temperature, the heat loss from the box increases. When the heat gain and heat loss become equal in the box, the temperature will reach its maximum level.

Variation / extension
You can cook rice in the cardboard box.

Keep cardboard of different colours in the sunlight for 10-15 minutes. Touch them and note which colours make cardboard hotter.

Evaluation
Ask the students to explain the working of a solar cooker.

Thrust area
Energy, Environment

Subject
Science

Place
Outdoors, Home

Group size
Entire class

Duration
3 hours

Suitable time
Summer

Materials
Wooden or cardboard box without a lid, glass sheet to cover the box, thermometer (0^{o} to 100^{o} C), black paint.

KEEP YOOR COOL

36

Objectives
To understand how evaporative cooling works in different ways to create comfortable conditions.

Activity
Ask the students to blow their breath on the back of their hand. Now ask them to wet the back of their hand with water and then blow on it. Ask them to describe the difference between the two sensations.

Now discuss the following in the class:

• How does a *matka* cool water?
• How does a wet *khus* curtain cool the room?
• Why does one feel refreshed after taking a cold bath on a hot day?
• Why does the breeze that has come across a river or a lake feel cooler than the breeze that has come from land?
• When a pre-monsoon thunderstorm approaches at the end of summer, why does the temperature suddenly drop before the beginning of rain?
• If you walk or cycle past a dense growth of trees on a hot day, that stretch of road feels cooler even when you are not in the shade. Why does this happen?

Ask students to suggest how buildings, neighbourhoods and cities can be made more comfortable by having lots of trees.

Variation / extension
If there is a wooded area or a forest easily accessible from the school, the class may be taken there on a hot afternoon on a picnic-cum-learning session. In addition to the cooling effect of trees, their role in hydrological cycle and in controlling climate may also be explained.

Take two identical mud pots with lids. Fill both with an equal quantity of water. Wrap a wet cloth around one. The cloth should preferably be folded in layers. Leave the two vessels standing in an open place for 3-4 hours. Keep the cloth wet by sprinking some water on it periodically. In which pot is the water cooler?

Evaluation
Ask the students:

Our elders often grumble that the climate has become warmer from the time they were young. Is this mere nostalgia or is there some truth in it? If you think they are right, what could be the reasons?

Thrust area
Forestry, Habitat

Subject
Science

Place
Outdoor, Classroom

Group size
Entire class

Duration
30 - 40 minutes

Suitable time
Afternoon in Summer

Materials
None

ALGAL BLOOM	37
Objectives To understand how phosphates in detergents and fertilizers affect algal growth. **Activity** Ask students to collect some algae from a pond or a ditch. Let them take two jars. They should fill three-fourths of one with tap water and three-fourths of the other with water containing some detergent or any phosphate fertilizer. Now let them add small but equal amounts of algae to both the jars. Let the jars remain in direct sunlight for two weeks. After two weeks ask the students to compare the algal growth. In which jar is there more algal growth? Discuss why this happens and relate this activity to the effects of polluted water containing phosphates on water bodies like lakes and ponds.	**Thrust area** Ecology, Pollution **Subject** Science **Place** Classroom, Home Outdoor **Group size** Individual, 3 to 5 Students **Duration** 2 weeks **Suitable time** Any time **Materials** Two glass jars, algae, one teaspoonful of detergent powder any phosphate fertilizer, water.

WHICH IS LIGHTER?

38

Objectives
To observe the effect of heat on the weight of air.

Activity
Find a smooth wooden stick or a ruler to use as the horizontal bar for constructing a balance. Tie one end of a string around the middle of the stick. Also tie strings to each end of the stick.

Take two similar paper bags with rectangular bottoms. Attach the flat bottom of each bag by means of an adhesive tape to each of the two side strings. Suspend the bags from the strings. The open end of the bags should hang downward.

Suspend the balance from the middle string with a hook. Balance the equipment so that the stick remains in a horizontal position, by adjusting the position of the end strings.

Light a candle or an oil lamp and keep it below one of the bags at a distance of 15-20 cm. Ask the students to observe what happens.

Repeat the activity by keeping the lamp below the other bag.

Remove the burning lamp and observe the balance for 5-10 minutes.

What happens?

Variation / extension
Observe the smoke rising ham a burning candle or *agarbatti*. The rising of hot air can be explained in terms of difference in weight per unit volume (density) of hot and cold air. The volume of air increases on heating and decreases on cooling.

Evaluation
Ask the students to explain what happens to the balance. Why ?

Thrust areas
Energy,
Environment

Subject
Science

Place
Classroom

Group size
Entire class

Duration
40 - 50 minutes

Suitable time
Any time

Materials
A wooden stick about 1 metre long,
2 paper bags,
strings,
adhesive tape,
kerosene-lamp,
matchbox, scissors.

FOOD FOR PLANTS

39

Objectives

To understand how manure improves plant growth.

Activity

Obtain enough soil from a footpath, eroded field or wasteland to fill one-and-a-half flower pots. Take some of this soil and fill one flower pot with it. Mix the remaining soil with an equal quantity of manure. Fill the second pot with this mixture. Label the pots.

Plant several beans in the soil in a garden. When they start growing well, transfer equal number of seedlings to the two flowerpots. Keep the pots in a place where they will receive sunlight. Water them regularly. Watch the differences in growth, if any.

Evaluation

In which flower pot do the plants grow better? Why?

Thrust area
Agriculture

Subject
Science

Place
Outdoors, Laboratory

Group size
Entire class

Duration
One or two months

Suitable time
Any time

Materials
2 flower pots, manure, bean seeds.

ENERGY RELAY

40

Objectives

To demonstrate that with every energy transfer, a loss occurs.

Activity

The students should be divided into two equal groups. Each group should form a row, standing one behind the other. The rows should be parallel to each other. Each student should stand two paces away from the next student.

Give a cup full of water and a teaspoon to the first student in each row and a similar empty cup to the last student in each row. All the other students should be given a spoon each. The first student with her cup of water stands facing her row. The second student moves to the cup bearer who takes a teaspoonful of water and transfers it to the spoon of the second student.

The second student then takes the spoonful of water and transfers the water to the spoon of the third student. Then the second student goes back to the first student for another spoon of water. In the meanwhile, the third student carries the teaspoonful of water to the fourth student and transfers it to his spoon. The fourth student takes it in his spoon and transfers it into the spoon of the fifth student and so on, till the water reaches the last student. The last student receives the water in his empty cup.

When the leader's cup is empty, let the students see how much water there is in the tail-ender's cup.

You could generate a discussion on what happens to the missing spoons of water. Tell the students that each spoonful of water represents a quantity of energy and that loss of energy takes place at every transfer.

Variation / extension

The students can play the same game again, taking care to minimize the loss of water (energy) in transfer.

Thrust area
Energy, Conservation

Subject
Science, Maths

Place
Outdoors

Group size
2 groups of 12 or more

Duration
30 minutes

Suitable time
Any time

Materials
4 cups, spoons (as many as there are students), water.

CLIMBING WATER

41

Objectives

To demonstrate that water not only travels downwards in the soil, but can also rise upwards.

Activity

Ask the students to dip the lower part of a strip of blotting paper in a glass tumbler containing water. They will observe that the water moves upwards along the strip.

Take a wide-mouthed transparent bottle. Fill it three-fourths with dry soil and cover the mouth with a piece of cloth. This should be held in place with a rubber band or string. Place the bottle upside down in a pan or any other container filled with water. The bottle's mouth which is covered with cloth, should remain dipped in water. Let the students note the condition of the soil.

Keep the bottle in this position overnight. Next morning ask the students to observe if water has travelled up the soil as it did in the case of the blotting paper. Let them note to what height the soil is wet.

Explain to the students that the rise of water through paper and soil is due to capillary action. The pores in soil or paper act as small capillaries.

Variation / extension

The experiment may also be done by using blackboard chalk.

The students may use various types of soil, and compare the rate of rise of water through each of these.

Thrust area
Agriculture

Subject
Science

Place
Classroom

Group size
Individual

Duration
2 sessions of half-an-hour each

Suitable time
Any time

Materials
Blotting paper, glass tumbler, wide-mouthed transparent bottle, piece of cloth, rubber bands / string, a pan, dry soil.

SPONGE GARDEN

42

Objectives

To demonstrate that a seed can germinate without soil, given the right conditions.

Activity

Ask the students to take some bean seeds. They should soak the seeds overnight in a glass or beaker containing water.

The students should place a wet sponge in a container with a little water, so that the sponge remains moist. Ask the students to place the seeds on the sponge, in several rows. Care must be taken to keep the container at room temperature and at a place where it can receive moderate sunlight.

If the weather is very dry, let them sprinkle water over the sponge regularly.

After about a week, students will observe that the seeds have germinated. Discuss what conditions are necessary for seed germination. What is the food source for seeds until they sprout?

Will the young plant grow to maturity on the sponge?

Variation / extension

The students could carry out the activity without wetting the cloth or cotton in water, and in different locations such as a dark area, in direct sunlight etc, for comparative observations.

Thrust area
Agriculture

Subject
Science

Place
Classroom, Home

Group size
Individual

Duration
One week

Suitable time
Any time

Materials
Bean seeds, sponge, cloth or cotton wool, tray, beaker, water.

HOT FACTS	43
Objectives To demonstrate the difference in energy consumption when cooking in covered and uncovered vessels. **Activity** Ask the students to do the following: Pour two cups of water into a vessel. Place it on a lighted stove and record the time required for the water to boil. Empty the vessel and let it cool. Pour two cups of water into the vessel again and cover it with a tight-fitting lid. Place the vessel on the stove and record the time that it takes for the water to boil. You will know that it is boiling when you can hear the water against the sides. In which case does the water take more time to boil - when the vessel is without the lid or with the lid on? **Evaluation** Discuss with the students how they will save cooking energy at home, what they will do to keep bath water warm, etc.	**Thrust area** Energy **Subject** Science **Place** Classroom, Home **Group size** Individual, 10 to 15 students **Duration** 30 - 40 minutes **Suitable time** Any time **Materials** Cooking vessel with lid, water, stove, clock.

SLOW AND STEADY

44

Objectives

To demonstrate the effectiveness of dry farming techniques through pitcher irrigation.

Activity

Divide the class into three or four groups. Contact the nearest forest department office and get 6-8 saplings of a fast growing tree species such as *Subabul*, *Sahjan* (drumstick) or *Neem*. The saplings should be 60-90 cm high. Give each group two saplings. Ask each group to dig two pits measuring 45 cm x 45 cm x 45 cm. These pits should be at least one metre apart.

Let them fill half of each pit with the dug-up soil, hold a sapling in the middle of the pit and fill the pit with the remaining soil, pressing it down to hold the sapling firmly.

Students should take care not to damage the roots while planting the sapling.

About 25-30 cm from the base of one of the two saplings planted, ask each group to dig a pit large enough to hold a pitcher. Let them punch a few holes in the base and one side of the pitcher by gently tapping a nail into it.

Now ask them to bury the pitcher so that only its mouth remains above the ground. The punched side of the pitcher should face the plant. The pitcher should be filled with water and its mouth covered with a lid.

Of the two saplings planted by each group, the one with the pitcher should be watered only by filling the pitcher once a week. The other one should be watered directly once a week. Let each group measure and note the amount of water used for watering the first sapling once a week. They should also note the amount of water needed to fill the pitcher to its rim every week. Let the students monitor the growth of the two sets of trees for at least four months.

Variation / extension

Ask the students to locate a tree in the neighbourhood which seems to be drying up. Let them bury a pitcher or drum with small holes next to it. Let them pour water into the container at regular intervals and observe what happens to the tree.

Thrust area
Environment

Subject
Science

Place
Outdoors

Group size
Groups of 10 to 15 students

Duration
Planting - one hour, Monitoring - four to ten months

Suitable time
Any time

Materials
Shovel or hoe, earthen pitchers, or pot, lid for pitcher or pot, large nail, measuring cup.

Evaluation Which of the saplings is growing the best? If there are differences in the rates of growth of the saplings grown by different groups, what could be the reasons for these differences? How does the pitcher provide water to the plant? Why is the pitcher buried in the root zone of the plant?	

DUNG POWER

45

Objectives

• To demonstrate that energy can be generated from waste material.
• To demonstrate that animal dung can be used for making biogas.

Activity

Arrange for a tin can of 10-15 litres capacity to be placed in the school compound or laboratory. The tin should not have any holes except the opening. Also arrange for a rubber cork which fits this opening. This should have one hole just large enough to take a tube with a hypodermic needle attached at one end (the tube used for blood transfusion would do).

Ask students to collect and bring 3 to 5 kg of wet cowdung. Put this in a container, pour 3 litres of water and stir well with a stick.

Pour the mixture into the tin can with the help of the funnel. Fit the tube into the opening of the one-holed rubber cork and close the can with this cork. The outer end of the tube has a hypodermic needle attached to it.

Tie the tube with a string to prevent the escape of biogas through the hypodermic needle. Allow the tin can to stand for 24 hours.

Keep the windows of the room open during this time so that if there is a leak of biogas, this can escape. The next day, loosen the string on the tube. The students should be able to smell the gas. Tell a student to bring a lighted matchstick near the opening of the needle.

The gas will burn with a tiny flame.

THIS ACTIVITY SHOULD BE DONE WITH EXTREME CAUTION

Variation / extension

Biogas can be prepared from the dung of other animals. In several rural areas, biogas is made from animal dung and human excreta.

The gas production in the tin can be slowed down by immersing it in cold water for some time. This shows that gas production is lower at lower temperature and higher at higher temperatures.

Evaluation

Discuss how biogas is an important renewable energy source and what kind of uses it can be put to, e.g. for heating, lighting or running engines.

Thrust area
Energy

Subject
Science

Place
Outdoors, Laboratory

Group size
Entire class

Duration
2 days (30 minutes each)

Materials
10-15 litre capacity tin container, one-holed rubber cork, tubing with a hypodermic syringe, wet cowdung, water, bucket, string, matchbox.

NEWS MAKERS

46

Objectives

To make students aware of how newspapers and magazines highlight and discuss the issue of environment.

Activity

Ask students to read daily newspapers and mark out articles, news items and photographs on environment-related issues. After everyone at home has finished reading the paper, they should clip these items and bring them to the class the following day.

Students can also collect news items from old newspapers. These clippings should be put together at the end of the week and a large collage made from them. The clippings can be stuck on a cardboard or chart paper. Names of the newspapers from which the clippings have been taken, and the date, should be written next to each clipping.

Those news items or articles which relate to local conditions or issues should be highlighted. Students can also classify all the items under subject heads that they can choose, e.g., wildlife, water, garbage, pollution, etc. These issues could also be announced during school assemblies.

The collage should be put up where the whole school can see it. Use this collage to start a discussion on environment and the role of the press in creating awareness about environment among the public.

Variation / extension

Students can individually, or in groups, design posters or newspaper advertisements which highlight the need for, or methods of protecting the environment.

Students can be asked to make short presentations on the basis of their posters or the newspaper clippings.

Students could also be encouraged to write on local environmental issues in the 'Letters to the Editor' column.

Evaluation

Ask the students to make a list of environmental issues that they have learnt about from the clippings.

Thrust area
Environment

Subject
Language

Place
Classroom, Home

Group size
Individual

Duration
Variable

Suitable time
Any time

Materials
Old newspapers and magazines, chart paper, scissors.

BITE, CHEW, NIBBLE

47

Objectives

To learn the functions of different types of teeth.

Activity

Ask the students to bring to the class different food items like a piece of bread or *chapati*, a piece of sugarcane, some fruit (guava, apple, a slice of melon), cooked rice, etc.

Let the students feel their teeth or look at them in a mirror and note the different kinds of teeth. They can also look into each other's mouths.

Call a student and ask him to eat one of these items in front of the class. Instruct the rest to observe closely how their friend goes about eating the morsel and how he uses his teeth at various stages of the eating process.

After he has finished eating, ask him to state which teeth he had used and in what order.

Call another student and ask him to eat another of the food items. Instruct him and the class as before.

Repeat the same activity with the other students till all the food items are over.

After this you can explain to the class the uses of different teeth while eating. Also how certain things like chewing gum, chocolates and sweets are harmful to teeth.

Variation / extension

The observation of the use of teeth can also be extended to a variety of animals.

Thrust area
Health

Subject
Science

Place
Classroom

Group size
Entire class

Duration
30 - 40 minutes

Suitable time
Any time

Materials
Different food items- some hard, some crisp, some soft, a mirror.

ENERGY IN DAILY LIFE

48

Objectives

To study instances where energy is converted from one form to another.

Activity

Take the class on a walk outside the school campus. Students should work in groups of 2 to 3. During the walk of about 15-20 minutes, they should be asked to list down all the energy conversions they can see or hear. On their return to the class, they should prepare a table in the following manner:

Object	**Energy source (what it runs on)**	**Converted to (form of energy)**
Car	Petrol	Motion, sound, heat from exhaust pipe
Street lights	Electricity	Light
Chulha	Coal/firewood	Heat, Light and sometimes sound
Horse	Grass/hay	Motion

Depending on the inputs from different groups, ask the students to prepare a master list of their findings.

Variation / extension

Ask the students to identify, where the energy sources they listed got their energy from.

Thrust area
Energy

Subject
Science

Place
Outdoors

Group size
2 to 3 students

Duration
30 - 40 minutes

Suitable time
Any time

Materials
Paper, pencil

LIFE IN SAND

49

Objectives

To enable students to understand that moisture is important for the growth of micro-organisms.

Activity

Ask the students to wash some sand thoroughly with water, in order to remove all the mud and humus particles. Let them dry the washed sand in the sun.

Let them take two clean and dry beakers and label them '1' and '2'. They should divide the sand into two parts and transfer one part to Beaker 1.

Ask them to moisten the remaining sand by adding a few drops of sterilized water (water that has been boiled and cooled), and transfer it to Beaker 2.

Let them cover both the beakers with glass plates and seal with candle-wax. The sealed beakers should then be left in an undisturbed place.

After two or three days, ask the students to take samples from each beaker and study these under a microscope/magnifying glass. Let the students record what they observe.

If they see any life in the sample of sand from one of the beakers, let them reason out from where it could have come.

What factor could have made life possible in one beaker and not in the other?

Thrust area
Ecology

Subject
Science

Place
Classroom

Group size
2 to 3 students

Duration
30 minutes

Suitable time
Dry season

Materials
2 beakers, candle, sand, microscope or magnifying glass, sterilized water.

HOW MUCH RAIN?

50

Objectives

To introduce a method of measuring rainfall.

Activity

Ask each student to bring a funnel and a transparent bottle from their homes. The diameter of the base of the bottle and that of the wider end of the funnel should be the same.

At the beginning of the rainy season, take the students to an open area near the school. The area should be more or less flat. Ask them to keep their tin cans or bottles on a spot chosen by them and place the funnel in it. They must ensure that the container is not disturbed during the period of rain and is not toppled over by the wind. It would be a good idea to place the bottle in a shallow depression created by digging the soil upto a depth of a few centimetres.

Every day, let the students collect their containers carefully without spilling the water in it, and using a scale, measure and record the height of the water that has collected in it. The containers should be emptied and put back in the same place. Let them maintain a record of their daily measurements.

Variation / extension

Ask the students to compare results with each other. They may also compare their results with what is recorded at a nearby metereological station They can get this information from the next day's paper or from the weather bulletins on radio or TV. The students can make this a daily activity for one rainy season and compute the annual rainfall for their area.

A discussion on how rainfall affects various people like farmers, pilots, fishermen etc, can be carried out along with the activity.

Thrust area
Environment

Subject
Science, Social Studies

Place
Home, School

Group size
Individual

Duration
Over a twenty-four hour period during monsoon, to be repeated on rainy days

Suitable time
During rainy season

Materials
A transparent bottle (plastic or glass) or can of any size with a narrow neck, a funnel the diameter of which equals the base of the container, a measuring scale.

FOOD VALUE

51

Objectives

To associate various types of food with different aspects of nutrition.

Activity

Take about 60 to 70 rectangular slips of paper and write down names of energy giving, body building and immunity-giving foods. Some examples are given below:

A	B	C
Energy Giving	Body Building	Immunity Giving
Sugar	Pulses	Tomato
Wheat	Eggs	Cabbage
Rice	Meat	Lemon
Potato	Fish	Spinach
Oil	Chicken	Papaya
Ghee	Groundnut	Banana

Draw a circle (2 to 3 metres diameter) on the ground, either in the classroom or outside. Fold the slips and place them in the circle. Ask the students to move around the circle and then pick up any two slips each. The students are asked to open the slips and read the contents.

On the blackboard, draw three columns and give them headings as above. Ask students to place the name of the food item on their slip under A, B, or C.

Each student should be able to say whether she is deficient in one or two out of A, B and C, according to her lottery.

Variation / Extension

Instead of nutrition, one can prepare slips with names of diseases and ask the students to give causes and precautions to be taken to avoid the disease.

Thrust area
Health, Nutrition

Subject
Science

Place
Outdoors, Classroom

Group size
Entire class

Duration
45 minutes

Suitable time
Any time

Materials
Paper, pencil, chalk, blackboard.

NEW FROM OLD

52

Objectives

To encourage students to learn to use waste material for craft activities.

Activity

Ask each student to bring an empty dropper bottle with a nozzle (as in eye or ear drops) to the class.

The plastic lid with nozzle should be turned into the bird's head and beak. For eyes, two bits of coloured paper should be stuck on either side of the nozzle. The nozzle should be covered with coloured paper to resemble a bird's beak. The bottle itself should be made into the bird's body by wrapping it with coloured cloth, coloured cotton wool, etc. Let each student use her imagination in creating a beautiful bird.

The wings can be made out of stiff paper and stuck to the body.

The bird is ready to fly!

Different colours could be used to make different birds.

Variation / extension

Discuss the major types of wastes generated in a home. The wastes could be segregated into biodegradable, reusable and recyclable wastes. Collect the reusable wastes like plastics, paper, bottles, bottle caps, toothbrushes, etc., and try to use these as craft materials to make birds, animals, etc.

Thrust area
Environment

Subject
Science, Craft

Place
Classroom

Group size
Individual

Duration
15 - 30 minutes
(1 class period)

Suitable time
Any time when class is in session

Materials
Small glass bottle with nozzle (as in eye and ear drops) stiff coloured paper, scissors, coloured cloth or cotton wool and gum

SUBJECT AREAS

Activities Classified by Subjects

Science
Activity Numbers: 1, 2, 4, 5, 6, 7, 10, 13, 14, 15, 16, 17, 19, 20, 22, 23, 25, 26, 27, 28, 30, 31, 34, 35, 36, 37, 38, 39, 40, 41, 42, 43, 44, 45, 47, 48, 49, 50, 51, 52

Craft
Activity Numbers: 5, 8, 26, 28, 34, 52

Social Studies
Activity Numbers: 3, 10, 12, 19, 21, 24, 28, 33, 34, 50

Physical Training
Activity Numbers: 2, 11, 18

Mathematics
Activity Numbers: 9, 11, 17, 21, 23, 28, 40

Language
Activity Numbers: 16, 30, 46

THRUST AREAS

Activities Classified by Thrust Areas

Environment
General
Activity Numbers: 2, 8, 9, 11, 16, 19, 21, 23, 24, 28, 30, 33, 34, 35, 38, 44, 46, 50, 52

Ecology
Activity Numbers: 1, 6, 7, 15, 31, 37, 49

Wildlife
Activity Numbers: 1, 5, 7, 26, 32

Energy
Activity Numbers: 4, 13, 25, 27, 35, 38, 40, 43, 45, 48

Habitat
Activity Numbers: 3, 12, 26, 36

Health and Nutrition
Activity Numbers: 18, 31, 34, 47, 51

Pollution
Activity Numbers: 37

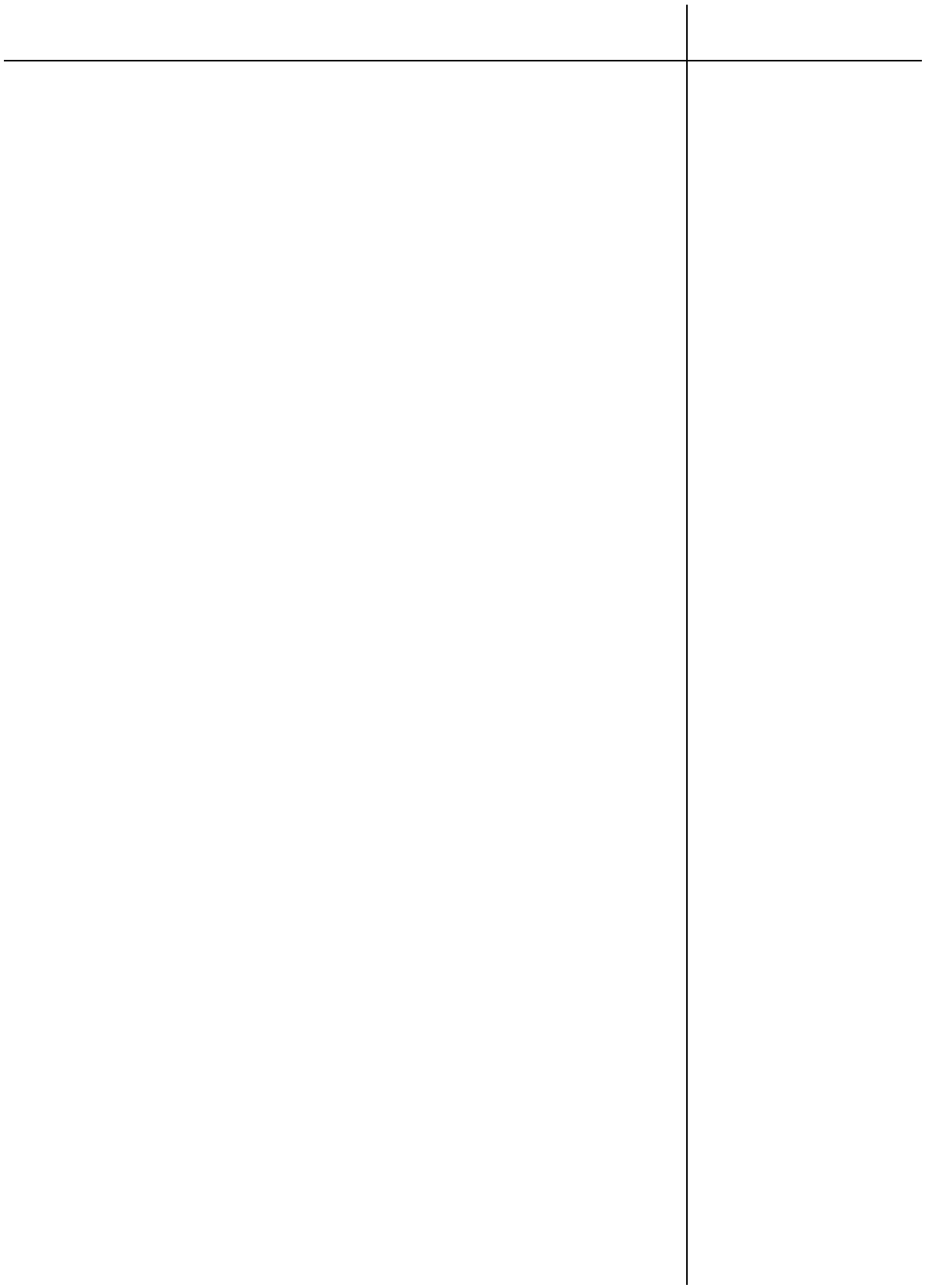
Population
Activity Numbers: 12, 29

Conservation
Activity Numbers: 4, 17, 40

Agriculture
Activity Numbers: 10, 14, 20, 22, 41, 42

Forestry
Activity Numbers: 28, 36

ADD YOUR ACTIVITY	
Objectives Activity	**Thrust areas** **Subject** **Place** **Group size** **Duration** **Suitable time** **Materials** **Source**



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