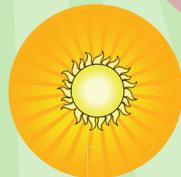


Environmental Studies

EXPERIMENTS

PROJECTS

ACTIVITIES



BOOK

2

Vidhu Narayanan

Syamala Srivatsa

From the desk of Dr R K Pachauri

The world's urban population is projected to increase from 3.6 billion to 6.3 billion between 2011 and 2050. It is also projected that by 2020, half of Asia's population will be living in urban settings. While urbanization suggests economic opportunity and growth; its flip side implies detachment from nature.

Young children live in a sort of wonderland. They look at objects with a sense of awe and wonder, inspect them, and then embrace or discard them. They may like to collect leaves, pebbles, wild figs, etc. This quest or exploration is a potential tool for teachers to engage the young minds with nature. And research suggests that environmental education not only involves students in learning, but in raising their test scores and encouraging them to pursue careers in environmental and natural resources.

Students are equipped for tomorrow's challenges in schools. They are taught complex environmental issues here and are trained to be good stewards of the environment. The need of the hour is to not only raise talented and intelligent individuals at schools and other institutions, but to develop an environmentally-literate generation of problem solvers. It will help ensure that tomorrow's decision-makers are prepared for the challenges they might face.

The series titled *Environmental Studies* has been developed with such a vision. It is a rich resource for children to understand their natural environment through projects, experiments, games, audits, surveys, and activities based on understanding the essence underlying air, water, soil, and energy conservation. The contents of the books of this series aim to encourage children to "study nature".

Since children are going to become leaders of the future, it becomes our primary responsibility to equip them for tomorrow's challenges. A major part of this involves commitment from us to provide them with environmental education that helps them become the educated thought leaders of tomorrow.



R K Pachauri

Director General, TERI



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Bury your Garbage!

To explore what happens to different waste materials after they are thrown away

FOCUS AREA
Garbage

LOCATION
Classroom

GROUP SIZE
5-6 children

DURATION
Few months

SKILLS

▶ Observation, investigation, awareness, scientific methodology, classification, decision making

Have you ever wondered where does waste go after it is thrown away? Well, it is collected from your home or school and taken to a municipality dump, where it is sorted and eventually transported in trucks to a “landfill”. Here tonnes of garbage builds into a mountain. But this is not a feasible solution, as some of the garbage decomposes and disappears but much of it doesn’t. You may try to bury different kinds of waste to understand what happens to it.

YOU WILL NEED

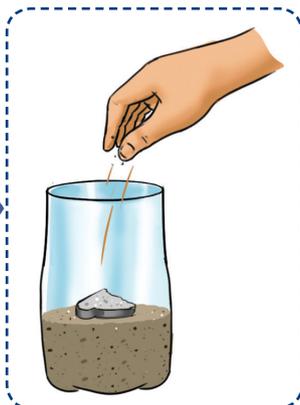
- Pieces of waste samples – paper, egg shell, plastic packet, fruit peels (banana and apple), tin-can lid, aluminium foil, bread, cotton cloth, styrofoam cup or plate
- Nine 2-litre plastic bottles
- Garden soil
- Paper cards for labels
- Sellotape

GET STARTED

1. Gather all the waste samples and try to assess the time that each sample will take to decompose.
2. Take the plastic bottles and cut them into two parts.
3. Partially fill a bottle with soil. Then place a sample inside it. Cover the sample with more soil. Repeat this step for all bottles.
4. Remember to sprinkle water in bottles to keep the soil moist.
5. Label the bottles and keep them near a sunny, warm place.
6. After a week, dig out the waste samples from the bottles and record the changes that you see in each waste sample. What decomposes quickly? What doesn’t?
7. Bury the waste samples back into the soil and don’t forget to keep the soil moist.
8. Unearth the samples every week for a month and see how they look each time.



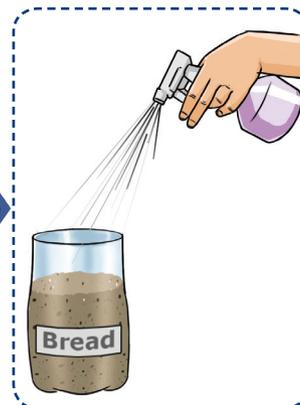
Step 2



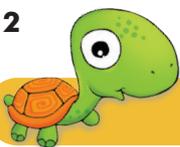
Step 3



Step 3



Step 4



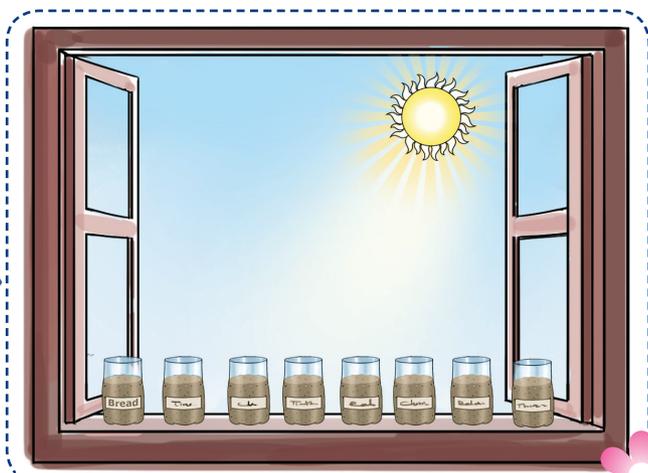
MY OBSERVATIONS

Garbage sample	Time you think the waste sample will take to decompose	How does it look?			
		After 1 week	After 2 weeks	After 3 weeks	After 4 weeks
Paper					
Egg shell					
Plastic packet					
Fruit peels					
Tin-can lid					
Aluminium foil					
Bread					
Cotton cloth					
Styrofoam					

* You may repeat your recordings for the next few months to make more observations.

WHAT'S GOING ON?

Waste generated by us does not disappear magically. Fruits, clothes, paper, and bread are organic things. Their peels and leftovers form “biodegradable” waste that mixes with soil and becomes a part of nature. This waste doesn’t harm the environment. Plastic packet, tin can, and aluminium foil are products manufactured in factories. When these things are thrown away, they form “non-biodegradable” waste. This waste doesn’t decompose to become part of the Earth again. Sometimes it breaks down, but after hundreds of years only.



Step 5



HELPFUL HINTS

Continue observing the waste samples until you think these have decomposed well. After you have made several observations, talk to experts to find out how you can quicken the decomposition process.



BE CAREFUL

Make sure that the soil inside the bottles doesn’t get wet; it should be only kept moist. As far as possible, gather equal sized waste samples. Use the same garden soil for all samples. This will help you in a fair investigation.



EXPLORE FURTHER

- Find out what happens to garbage when it lands in the sea.
- Find out what happens to garbage that is thrown on the street or out in the open.



NOTE TO THE TEACHER

This experiment can be also done in a large wooden or cardboard box. Tell the students to divide the box in different sections and bury a waste sample in each. Tell them to insert labels, made of paper cards stuck on ice cream sticks, to identify the waste buried in each section.

Also point out to the students that we are running out of space to use as landfills. Moreover, these dumping grounds could have been put to a better use.

Compost It!

To gain an understanding of the lifecycle of biodegradable waste

FOCUS AREA

Garbage

LOCATION

Any isolated corner in school/
a corner in a garden

GROUP SIZE

3-4 children

DURATION

1-2 months

SKILLS

Experimentation, planning a procedure, problem solving, analyzing, observation

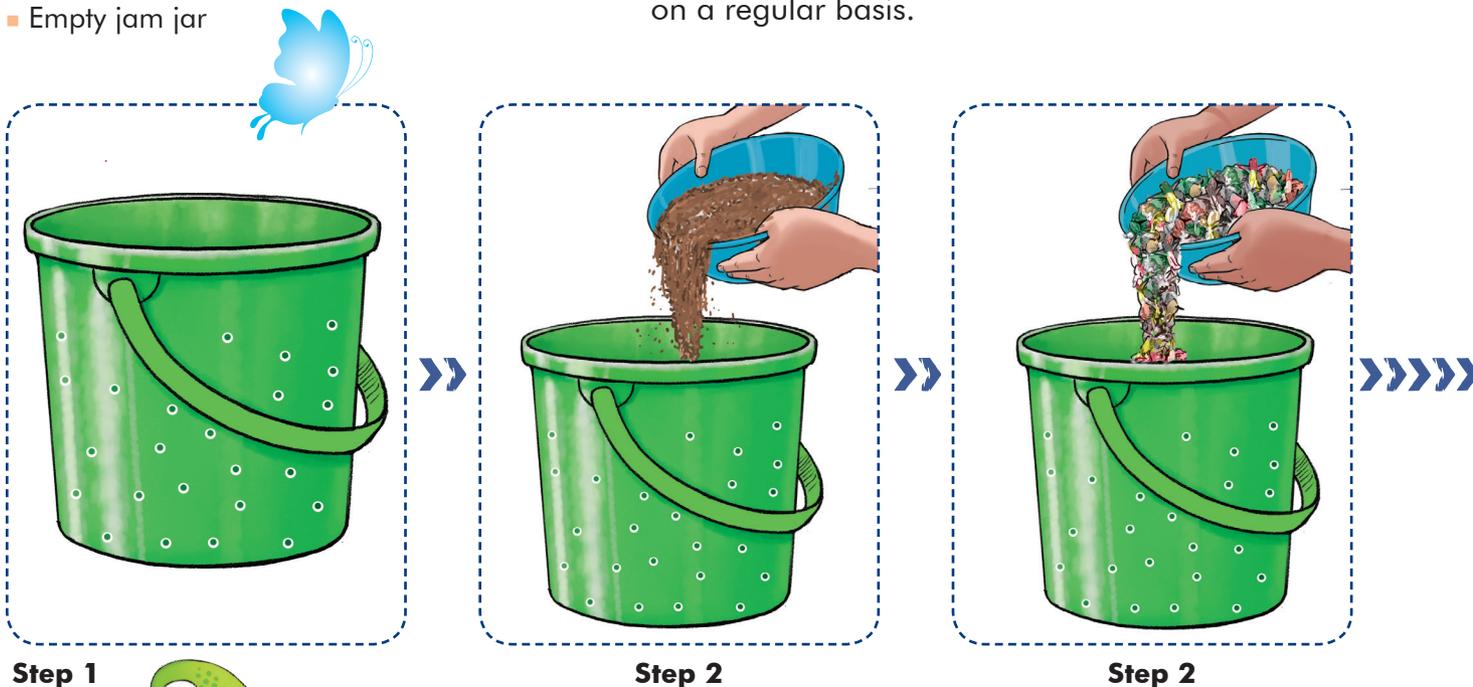
You must have heard of composting – a process by which garbage turns into manure that is useful for growing plants. Compost forms when organic matter decays or rots. Decomposers like bacteria, fungi, earthworms, and snails take on this task of decay. Composting is nature’s way of recycling. It adds to the richness of soil and reduces the load on landfills. Overall it is a simple process. You can use kitchen waste as raw materials, which you would have otherwise thrown away. So get started and make your own composter. Best out of waste!

YOU WILL NEED

- 20-litre plastic bucket with lid
- Trowel or spade
- Water
- Vegetables, fruit peels, leaf litter, and paper
- Soil
- Wooden stick
- Empty jam jar

GET STARTED

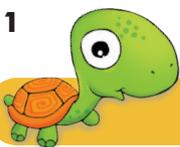
1. To make the composter, insert holes all over the plastic bucket. The holes will allow air to circulate.
2. Line the bottom of the composter with some garden soil and add kitchen or garden waste.
3. Cover the composter with the lid and place it in a sunny corner of the house.
4. Keep on adding kitchen waste to the composter on a regular basis.



Step 1

Step 2

Step 2



5. Remember to keep the compost mixture damp, not wet. However, if it gets wet, add some shredded waste paper to absorb the extra moisture.
6. Stir the compost mixture regularly with a wooden stick.
7. When the bucket is almost full, stop adding waste to it. Keep the lid on and let the composting process take place.
8. Remember to stir it regularly, so that air can enter the bucket, until your compost is ready.
9. Your compost, or manure, will be ready for use when it becomes dark, crumbly, with no sign of the original waste thrown in. It should also have a sweet earthy smell. But these indicators sometimes may not be enough. You may conduct a test to check this.

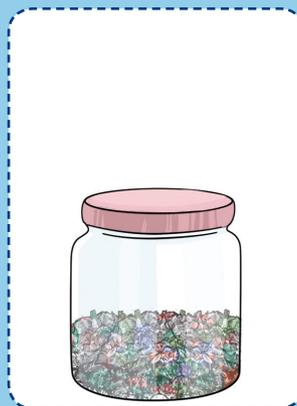
TEST YOUR COMPOST



1. Put some compost in an empty jam jar.



2. Add water to make it soggy.



3. Seal it tightly.



4. Open the bottle carefully after a week and check for any odour.

How will you know that your compost is ready? Well, if it smells like wet Earth, it is ready for use. But, if it smells foul, then you should wait for some more time.



Steps 3-5



Step 6



Step 7

WHAT'S GOING ON?

In decomposition, microorganisms breakdown organic matter to obtain energy. Two types of decomposition can occur in composting. "Aerobic respiration" occurs in the presence of oxygen as microorganisms that breakdown the organic matter need to breathe air to survive. "Anaerobic respiration" occurs in the absence of oxygen when the compost is too wet barring exchange of oxygen with the atmosphere. Aerobic respiration occurs at a faster rate than anaerobic respiration, because bacteria are able to digest more quickly in the presence of oxygen and heat.



HELPFUL HINTS

- Shredding kitchen waste, before adding it to the bucket, will speed up the process.
- Just like people, the microbes that decompose and turn your kitchen waste into manure need air, water, and food. If you aerate your mixture well, they'll happily turn your kitchen waste into compost much more quickly.
- Add red wiggler worms to your compost mixture and find out the difference in the composting process.



EXPLORE FURTHER

- Try composting with seed germination. How? Take two samples of seeds and germinate one sample in soil with compost and another in soil without compost. Observe both the samples to find out which one germinates faster.
- After this activity, you can develop a presentation or workshop on composting, make a pamphlet or brochure on composting, and organize sale of the compost you have prepared in school.



BE CAREFUL

- The compost mixture will attract small bugs and insects. These insects help in the composting process. So, don't keep your compost near kitchen or school canteen.
- Don't add meat items. They may attract rats.
- To avoid bad odour, stir the compost mixture regularly to aerate it. Make sure the mixture is damp and does not contain excess water.



NOTE TO THE TEACHER

Tell students that composting is not a new idea. It is a process that happens in the natural world all the time. It is as old as humankind. In recent times, the idea of composting has revived safe agricultural practices. It is a safe method to regenerate the soil.

Point out to students that it is an easy process, but it needs patient efforts. At least 20 per cent of the garbage that ends up in landfills is organic (things that were once alive). If we segregate this waste at home and compost it, then a lot of wastage can be prevented. This waste can be a resource for us.

This activity can be conducted at home or in school. It will be easier for the teacher to monitor the progress if the activity is done in school. Students can be asked to bring organic waste from home to add to the compost mixture. The class can be divided into 4–5 groups. Each group can set up their own composter.



Environmental Studies : Experiments, Projects, Activities : Book 2



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