



Are We Overusing Plastics?



Teacher Guide

This script is intended to

- a) draw attention to the problem of using plastics
- b) gaining an awareness of thermoplastic and thermosetting materials
- c) consider whether biodegradable plastics are a current reality.

Lesson Learning Outcomes

Lesson 1

At the end of this lesson, students are expected to be able to :

Make a list , and discuss uses, of plastics in daily life, especially in the home.

Explain the meaning of the word plastics.

Lesson 2

At the end of this lesson, students are expected to be able to :

Categorising items collected, based on the type of plastic

Lesson 3

At the end of this lesson, students are expected to be able to :

Devise tests for exploring the properties of different plastics

Carry out tests on the properties of thermoplastic plastics

Lesson 4

At the end of this lesson, students are expected to be able to :

Write a report on the conclusion of the experiments

Explain thermoplastic and thermosetting plastics

Explain the meaning of biodegradability

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Lesson 5

At the end of this lesson, students are expected to be able to :

Write a report on the operations of a plastics recycling plant



Suggested Teaching Strategy

1. Begin with a whole class discussion on how plastics have invaded our lives and how they are slowly replacing traditional materials like glass, porcelain, wood, paper, etc. in day-to-day use. The discussion can lead to an assignment for students - to observe and note the variety of uses plastics are put to, and to prepare a detailed list. Student Handout I could be used for the purpose.
2. After students have come back with their individual lists, there can be a further discussion, guided by the teacher, about the possible uses of plastics, ending up with an exhaustive list of plastic usage. The teacher may ask the students to prepare, collectively, an exhaustive list of plastic usage and display it in the class. This could be done by pooling together lists prepared individually by each student, as well as by small groups.
3. Ask students to collect discarded waste plastic materials from home for one week, or some other suitable period of time. Help them to make categories based on usage, such as plastic bags, wrappers, etc. See Student Handout 2.
4. Guide students in estimating the percentage of plastic waste vis-a-vis the total waste generated by a household. Show how different techniques can be used to estimate waste generation. For example:
 - (a) Multiply the waste generated by one household by one hundred to get an estimate about 100 households. It may be better, however, to get an average based on the data provided by the whole class and multiply it by 100.
 - (b) For estimating the waste generation by a city, the number of households can be calculated by dividing the total population by the average number of members in a household (4-5 for example).

Then total waste generation can be calculated based on the above data.

The result should be recorded in Student Handout 2. Emphasis may be laid on the enormity of disposal of such a huge quantity of waste.

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5. Students should be encouraged to create equivalent samples of various types of plastic waste and design tests for finding out:
 - (a) pliability/strength (e.g. how much weight a sample can take without stretching)
 - (b) effect of heating (small samples in a test tube could be taken)
 - (c) effect of water, cooking oil, methylated spirits, petrol, etc. on plastics.

The presence of the teacher is necessary when students conduct these experiments. *The teacher must see to it that students do not inhale fumes created by heating/burning of plastics.*
6. The teacher could make suggestions regarding reclassification based on the results of the experiments. Also if felt necessary the teacher may encourage students to find out
 - (a) common names of various types of plastic
 - (b) chemical names and formulas of the above
 - (c) reasons for varied properties of the plastics.

In case students are unable to get the above information, the teacher can demonstrate to them how to use various sources like encyclopaedias, the Internet, etc.

7. Facilities for conducting the experiment on biodegradability should be planned in advance so as to avoid last-minute confusion. Advance planning may include:
 - (a) demarcation of sites for pits
 - (b) tools for digging
 - (c) availability of varied waste materials including plastic waste
 - (d) availability of common salt
 - (e) dating of the pits.

The question of the use of common salt to aid decomposition could be discussed and reasons could be inferred. The effort should be to let students discover for themselves that plastics are not biodegradable. Also a discussion could be held on how non-biodegradability is threatening the environment and human life.

8. When visiting the plastics processing or recycling plant, the emphasis should be on:
 - (a) collecting information regarding additives like colours, plasticisers, resins and their carcinogenic nature
 - (b) the plastic recycling process - the various links in the chain - rag-pickers, *kabadiwalas* and plastic granule makers; and also the fact that only a fraction of the total plastic waste being generated is recycled
 - (c) drawing diagrams of plastic processing and how different kinds of plastics are processed differently.
9. After the students written report and drawn conclusions, small groups could be formed to focus on a particular aspect of the problem and come up with solutions. This may help in a focussed

brainstorming and debate on the issue of social responsibility for the excessive usage of plastics and their disposal. The points that are thrown up by the debate could be summarised by the teacher and then attached to each student's report as a recommendation of the group.



Achieving the Objectives

OBJECTIVE	This is achieved by
1. Decide, based on sound arguments, whether the public has a social responsibility to discard plastics more wisely, or whether we should ban certain types of plastics.	<i>participating in a debate or if a member of the audience, voting for or against the motion.</i>
2. Devise tests to distinguish between various plastics.	<i>devising additional tests to those given on the worksheet and using them to distinguish between different plastics.</i>
3. Co-operate as a member of a group.	<i>actively participating in group work.</i>
4. Communicate orally and in written form.	<i>discussing within the group and giving written descriptions of the manufacture of plastics and the recycling of plastics.</i>
5. Explain the recycling process for plastic waste.	<i>creating a written explanation for the recycling of different plastics.</i>