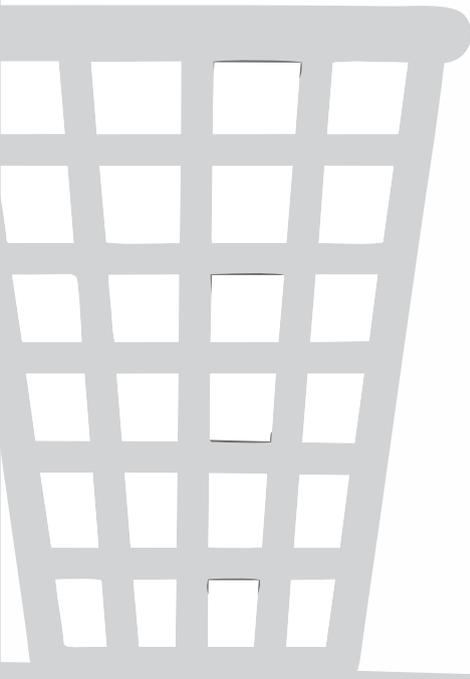


Litter Less



Lesson Plans for Teachers



Credits

Research and Writing: Sukhprit Kaur, Dr. Pramod Kumar Sharma, Ketki Gadre, Madhavi Joshi

Editing: Dr. Pramod Kumar Sharma, Sukhprit Kaur, Madhavi Joshi

Inputs and Suggestions: Malgorzata (Gosia) Luszczek, Nicole Ardeou, Shimon Ginzburg

Support : Prashant Moon, Jogendra Rajora, Abhishek Pawar

Design and Layout: Ravi Panchal

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About CEE

Centre for Environment Education (CEE) was established in August 1984 as a Centre of Excellence supported by the Ministry of Environment and Forests, Government of India. CEE develops innovative programmes, educational material and builds capacity in the field of education and communication for sustainable development.

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Introduction

Litter Less Campaign is a joint initiative of the Wrigley Company Foundation and Foundation for Environmental Education (FEE). Litter Less Campaign is being implemented through the Eco-Schools (ES) and/or Young Reporters for the Environment (YRE) programme. The Campaign aims to engage and educate children and young people on the issue of litter, and encourage them to make positive choices. It aims to reduce litter and affect long-term behaviour change amongst youth globally.

- **Eco-Schools** is a global sustainable schools programme – it starts in the classroom and expands to the community by engaging the next generation in action-based learning.
- **Young Reporters for the Environment (YRE)** aims to empower young people to take a stand on environmental issues they feel strongly about and to give them a platform to articulate these issues through the media of writing, photography or video.

In order to reduce litter and affect long-term behaviour change, an attempt has been made to create a set of Lesson Plans. The Lesson Plans in this document have been developed to enable teachers to guide classroom and outdoor learning on the wider challenge of litter and its linkages with our life styles. Lesson Plans have been developed with the following objectives:

- To raise awareness about litter and waste and its effect on the local environment and wider community.
- To increase students knowledge and change attitudes for preventing and managing litter and waste.
- To influence students' behaviour in preventing and managing litter and waste.
- To promote and improve waste management in schools and student's sphere of influence.
- To assess the waste literacy of students.
- To enable students to disseminate and exchange examples of work achieved in the context of litter and waste management.

Lesson plans have been organised/ categorised

1. under different strands and substrands.
2. with clear indication of the different learning outcomes which will be achieved through individual lesson plans.
3. based on methodology of two programmes: Eco-Schools and YRE.
4. age groups (for Eco-Schools 6-8, 9-12 and 13-16 and for YRE 11-14 and 15-18 years).
5. with appropriate SDG linkages suitable to the particular strand.

What the lesson plans help achieve?

These lesson plans have been compiled with the intention to enable teachers to guide students systematically and bring about litter and waste related learning and change in schools and the community through meticulous planning, innovative design and action.

Lesson Plans build in

1. hands on experiential and inquiry based learning for students.
2. curriculum linkages with different subjects , especially in case of lesson plans developed for the Eco-Schools programme.
3. ESD competencies - critical reflection and systemic future thinking, self awareness, integrated problem solving to name a few (Education for Sustainable Development Goals, Learning Objectives.
<http://unesdoc.unesco.org/images/0024/002474/247444e.pdf>)
4. provides opportunities for skill building including observation, data handling, analysis, interpretation and representation.
5. opportunities for building global citizenship by providing ideas for exchange of learning as part of the twinning programme.
6. capacities and leadership qualities.
7. confidence by enabling students to report and take action on issues of immediate concern, especially exposure to different types of methodology for capturing and reporting issues, specifically as part of the lesson plans developed for the YRE programme.
8. opportunities to promote international collaboration through the exchange of work - would help strengthen the Eco-Schools twinning opportunities.

The lesson thematic strand begins with **Before you Begin** section that provides the teacher with the basic information required to deal with the issue and have meaningful discussions with the students. A teacher might not have all the information required and **References/Further Readings** have been provided at the end of each thematic strand that lists resources in print, websites and videos used for developing the lesson plans and it can be used to get more details of the issue.

Title
Describes the lesson plan.

Introduction
Provides a brief insight into the lesson plan and also mentions the methodology that the particular lesson plan has adopted, for example learning processes could include hands on engagement, classroom interaction, group work, analysis of responses and communicating about the topic through an article, a facebook post, and/or video to name a few.

The form features a blue header with a 'Lesson 2 Plan' logo. Below the header is an 'INTRODUCTION' section with several lines of text. A box contains fields for 'YRE steps:', 'Curriculum Linkage:', and 'SDG Linkage:'. To the right are icons for 'Eco-Schools', a globe, '15-18 Years', and '12 SUSTAINABLE DEVELOPMENT GOALS'.

Curriculum Linkages
These have been specified in lesson plans pertaining to the ES and YRE programme and mention the different subjects like Science, Global Citizenship, etc to which linkages can be drawn by the teachers.

Programme and Age Group
This indicates the programme - Eco School/YRE for which the lesson plan is recommended. It also mentions the age group for the programme is suitable.

SDG linkages
The symbol indicates the linkage of the issue with the particular SDG Goals.

Objectives
What is intended to be achieved as part of the lesson plan is specified here.

Objective:
Students will be able to

Time required/ Duration:

Resources Required:

Duration
Lesson Plans range in duration from a few minutes to a couple of days. Duration has been specified in every lesson plan to help teachers' allocate time and plan the same.

Resources Required
Lists various resources including material, online resources, internet, worksheets, etc which will be required for conducting the lesson.

Activity
Implementation of the lesson plan has been divided based on the duration of engagement into classroom sessions and/ or group assignments. Classroom session: These are learning processes within a classroom set up and have largely looked at a duration of 45 minutes for any one session Group/Individual Assignment: These are generally longer duration learning process and could be achieved over a few hours to a few weeks. These are learning processes which involve group interactions, mostly based beyond classroom set-up, sometime restricted to work within the school and sometimes beyond the school.

The form has an orange header with a 'Lesson 2 Plan' logo. The 'Activity' section is divided into 'Classroom 1 session', 'Home Assignment', and 'Classroom 2 session', each with lines for notes. An 'Evaluation:' section is at the bottom. An illustration of a boy writing is in the bottom right corner.

Evaluation
It is important to understand whether students have achieved the learning intent. Different techniques have been suggested in different lesson plans.

SDG and its relation to the problem of Litter!

'Transforming My World: The 2030 Agenda for Sustainable Development' was adopted at the UN Sustainable Development Summit in 2015. The new framework was developed following the United Nations Conference in June 2012 organized at Brazil. The agenda contains 17 goals with 169 targets covering a broad range of sustainable development issues. The goals and targets demonstrate the scale and ambition of this new universal and global agenda to plan the course of action for the people, the planet and prosperity. It is expected that all countries and stakeholders, acting in collaborative partnership, will implement this plan and contribute in achievements of the targets. The Goals aim to secure a sustainable, peaceful, prosperous and equitable life on Earth for everyone now and in the future. The Goals are linked to each other or interdependent in one or the other ways. The achievement of the agenda needs to realise the links and plan our actions accordingly. Some of the linkages are direct and obvious to see but many are not. A brief is given below to explain the linkages of the problem of littering and litter waste with various SDGs. The brief is not exhaustive but is just indicative. During the transaction of lessons, encourage students to share other plausible linkages.

Sustainable Development Goal

Linkages with the problem of Litter



End poverty in all its forms everywhere

The littering behaviour and waste as such do not have direct linkages but it has been observed that people who are collecting and handling the litter and waste are generally from poorer communities in developing countries and are vulnerable to hazards associated with them.

Also, the impact of littered wastes is most on the poor communities as they are directly dependent on the natural resources to meet their food requirement.



End hunger, achieve food security and improved nutrition and promote sustainable agriculture

The irresponsible behaviour and ways of managing waste is polluting the land, air and water. Plastics littered around are killing various life forms especially in oceans; micro plastics have entered the food chain and are impacting the quality and quantity of food.



Ensure healthy lives and promote well-being for all at all ages

Need for sustainable management of waste , especially that are hazardous in nature and remain in our ecosystem by polluting air, water and soil. Also, the improperly disposed waste leads to contamination, and aids the growth of harmful pests.



Ensure inclusive and equitable quality education and promote lifelong learning opportunities for all

The target 4.7 explicitly recognizes the role of Education for Sustainable Development along with Global Citizenship in addressing the issues of sustainability like litter and associated behaviour.



Achieve gender equality and empower all women and girls

In developing and least developed countries, it is usually the women and young girls who are collecting littered waste. These women are often not recognised for the role they play in recycling of waste. Absence of safety equipments and practices makes them vulnerable to injuries and diseases.



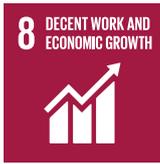
Ensure availability and sustainable management of water and sanitation for all

One of the major reasons of contamination of our water resources is dumping and other unsafe ways of dealing with waste, especially hazardous waste. By putting an end to these practices, we can make 'clean and safe water for all' a reality.



Ensure access to affordable, reliable, sustainable and modern energy for all

'Waste to Energy' is becoming a major component of energy mix. This requires proper segregation and channelization of waste that can be used as fuel. Efficient segregation will reduce the pollution load, as it will ensure better combustion. Additionally efficient segregation will also remove materials that release hazardous gases under certain conditions.



Promote sustained, inclusive and sustainable economic growth, full and productive employment and decent work for all

Resource recovery from waste and recycling are major sustainability strategies that depend largely on waste management systems and behaviours. This is emerging as a major sector of the economy. The health of workers handling different stages of the system and pollution reduction in the process are important concerns.



Build resilient infrastructure, promote inclusive and sustainable industrialization and foster innovation

Facilitation of sustainable and resilient infra-structure in the context of waste is an important element with cradle to cradle approach. 'Circular Economy' has been looked as one of the important aspects which emphasises on preventing products and materials from becoming waste for as long as possible and turning waste that cannot be avoided into a resource. This can boost growth, create jobs, help reduce greenhouse gas emissions and reduce dependency on imported raw materials.



Reduce inequality within and among countries

The inequality is reflected in the production and consumption behaviours. Waste and litter increases due to inadequate and inefficient collection and treatment systems. The production and consumption behaviours, also a product of inequity and cultures, has an impact on the amount of waste. International trading in waste has negative environmental impacts on developing and poorer nations. Also those involved in the recycling of this waste are the poor and vulnerable.



Make cities and human settlement inclusive, safe, resilient and sustainable

Waste management is vital to any functional urban environment. The safe removal and management of solid waste represents one of the most vital urban environmental services. Uncollected and unsegregated solid waste blocks drains, causes flooding and may lead to the spread of water-borne diseases.



Ensure sustainable consumption and production patterns

The goal looks at efficient use and management of natural resources, environmental impacts like waste management, education of consumer information and education for sustainable development. One of the specific targets of this goal is to reduce per capita food waste by 50 percent. Environmentally sound management of chemicals and wastes, and waste minimization & waste recovery are important aspects of sustainable development.



Take urgent action to combat climate change and its impacts

Everyone has a part to play when it comes to climate change as proper waste management can reduce greenhouse gas emissions. Waste is a resource if properly managed and recycled and can reduce the demand of energy and virgin materials.



Conserve and sustainably use the oceans, seas and marine resources for sustainable development.

Littering and improper waste management harms other life on earth and in the seas. Marine pollution is an alarming issue majorly contributed by waste due to its persistence, complexity and steady growth. It has started impacting the aquatic food chain with microplastics entering human food chain. Major cause of impact to marine life, are due to entanglement and starvation (caused after consuming plastics).



Protect, restore and promote sustainable use of terrestrial ecosystems, sustainably manage forests, combat desertification, and halt and reverse land degradation and halt biodiversity loss.

Littered waste is a hazard to various animals that mistake it for food. Litter also pollutes the land and chokes the soil that impacts the terrestrial flora and fauna.



Promote peaceful and inclusive societies for sustainable development, provide access to justice for all and build effective, accountable and inclusive institutions at all levels.

Impact of litter and waste on health of different societies and life forms is an important dimension of Peace and inclusiveness.



Partnerships for the Goal - Strengthen the means of implementation and revitalize the global partnership for sustainable development.

Litter and waste has to be seen as a global problem. The waste dumped in oceans does not have any boundary and impacts all!. The problem requires partnerships for capacity building to change of behaviour, have infrastructure in place for waste management, ensure practices which promote reuse and circular economy and right technology.

Earth Cycle of Resources

Before you Begin

We constantly need oxygen to breathe, water to drink and food to live. The carbon dioxide which animals breathe out is converted to oxygen by plants through photosynthesis and vice-versa. This is a continuous process which happens over and over again and hence we call it a “Cycle”. Cycles are part of nature. There is a limited availability of resources like water; elements such as oxygen, carbon and minerals and nature keeps the supply by continuously cycling them. If nature did not recycle these, we would have run out of the resources years ago.

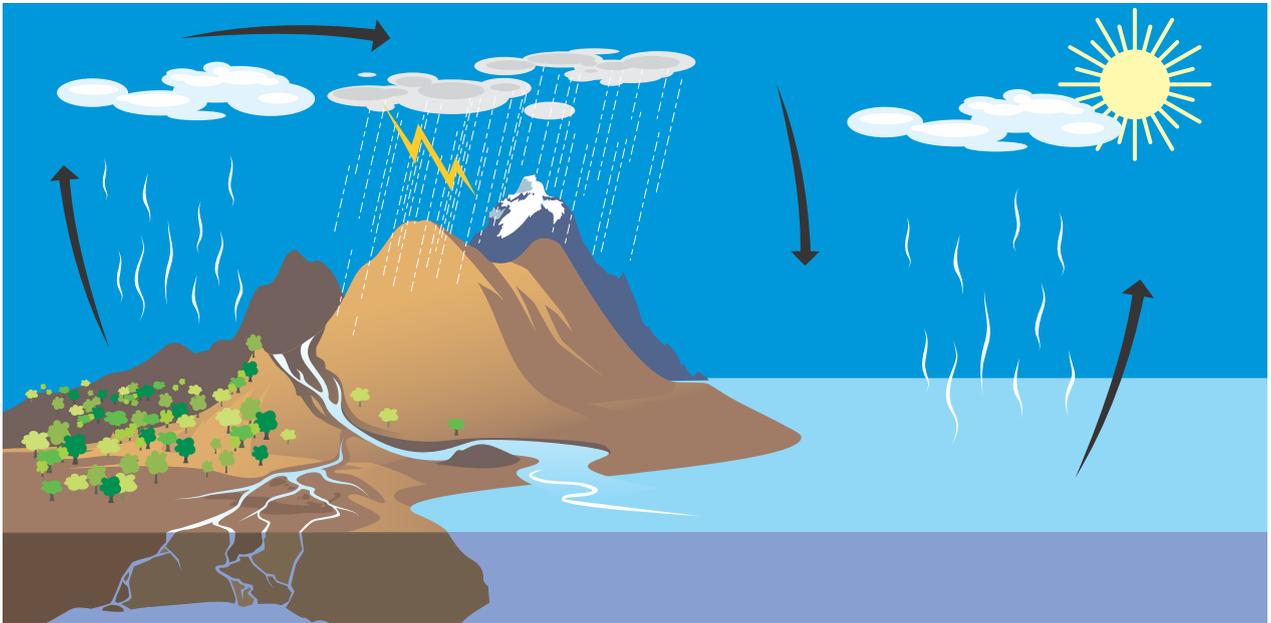
These cycles sustain various aspects of life on Earth including birth, growth, reproduction and death. The water cycle ensure the continuous circulation of water both above and below the ground. As part of the water cycle, water passes through all the different states that it exists as in nature - liquid water, gaseous vapour and solid ice. In addition to water there are a number of other substances that move through the abiotic and biotic components of the Earth. These constitute the biogeochemical cycles (bio = life; geo = Earth; chemical = elements including C, N, O, P). Some common examples of biogeochemical cycles are the carbon, nitrogen, phosphorous, nutrient and oxygen cycles. All these cycles together sustain the world and its various ecosystems.

Decomposition is the process by which organic substances are broken down into simpler matter. The process is a part of nutrient cycle and is essential for recycling the finite matter that occupies physical space in the biosphere. Bodies of living organisms begin to decompose shortly after death. Organisms that do this are known as decomposers.

Decomposers are organisms that break down dead and decaying organisms. They help recycle matter in an ecosystem. Decomposers are heterotrophic and derive energy by consuming other organisms. There are two main categories of decomposers. Chemical decomposers work by using chemicals in their bodies to break down organic matter into simple compounds for energy. Chemical decomposers include bacteria, protozoa, and fungi. Physical decomposers are detritivore that feed on the organic materials. Physical decomposers are mostly macro organisms that can be seen without a microscope. Some examples include worms, mites, flies, and snails.

It would help students to know the important role that different decomposers play in the decomposition process. Some decomposers are microscopic in nature e.g. bacteria and others are large enough and visible to the naked eye, e.g. earthworm. A short nature walk could help introduce students to some of the larger decomposers.

WATER CYCLE



Cycles in Nature



INTRODUCTION:

The balance in nature or on Earth has been achieved through cycles. Different systems are dependent on each other and have settled in cycles which has resulted in the right environment and conditions required for life to evolve and sustain.

The lesson plan encourages students to investigate cycles in nature. The learning processes includes hands on demonstration by individual students, brainstorming, reading and exchanging information pertaining to the topic (especially as part of twinning), classroom interactions, group work, nature walk, analysing responses from the twinned school and communicating about the topic through an article.

Objectives:

Students will be able to

- list “cycles” in nature.
- explain concept of cycle through water cycle.
- illustrate the nutrient cycle (Nitrogen).
- explain the steps in a nutrient cycle.
- explain how cyclic systems in nature do not produce waste.

Eco-Schools Steps: Curriculum linkages, Environmental review, Inform and Involve

Curriculum Linkage: Science/ Environmental Studies/Social Science



Eco-Schools

9-12
Years

Time required/ Duration:

- **Classroom Session 1:** 45 minutes for each student to conduct the hands-on demonstration to understand the water cycle.
- **Classroom Session 1:** 45 minutes (15 min to explain what “Cycles” mean and to then brainstorm with students other cycles in nature. 30 minutes provided to students to label and colour the Nitrogen cycle worksheet and explain the importance of cycles in nature and that in a truly natural system, no waste is created).

Resources Required:

- Hot water
- Large transparent bowl
- Cup to be placed in the center of the bowl
- Transparent plastic sheet
- Ice cubes
- Student notebooks, pencils and other stationary
- An online film of the facilitator's choice, which depicts to students the nitrogen cycle
- Resource 1 - (Nitrogen cycle worksheet)



Activity

Classroom session 1

1. Demonstrating water cycle

- Place some hot water in a large transparent bowl. Explain to students that the bowl represents water on Earth.
- Place an empty cup at the centre of the bowl to collect water which will precipitate back as rain.
- Cover the bowl with a transparent plastic sheet and place a few ice cubes on it.
- Ask students to record their observations.
- Explain to students that, when the hot water rises, it condenses in the atmosphere in the form of rain/precipitation (where there is lower temperature - represented here in the form of ice cubes).
- Students will notice that the empty cup which was placed in the centre of the bowl now has some water. Explain to them that the water got into the empty cup because of the process of condensation and precipitation.
- Explain to students that this movement of water is a continuous process and repeats over and over again and hence is referred to as the “water cycle”.
- Discuss the advantages of the water cycle. *For Example - It brings fresh water.*

Classroom session 2

2. Understanding the Nitrogen cycle

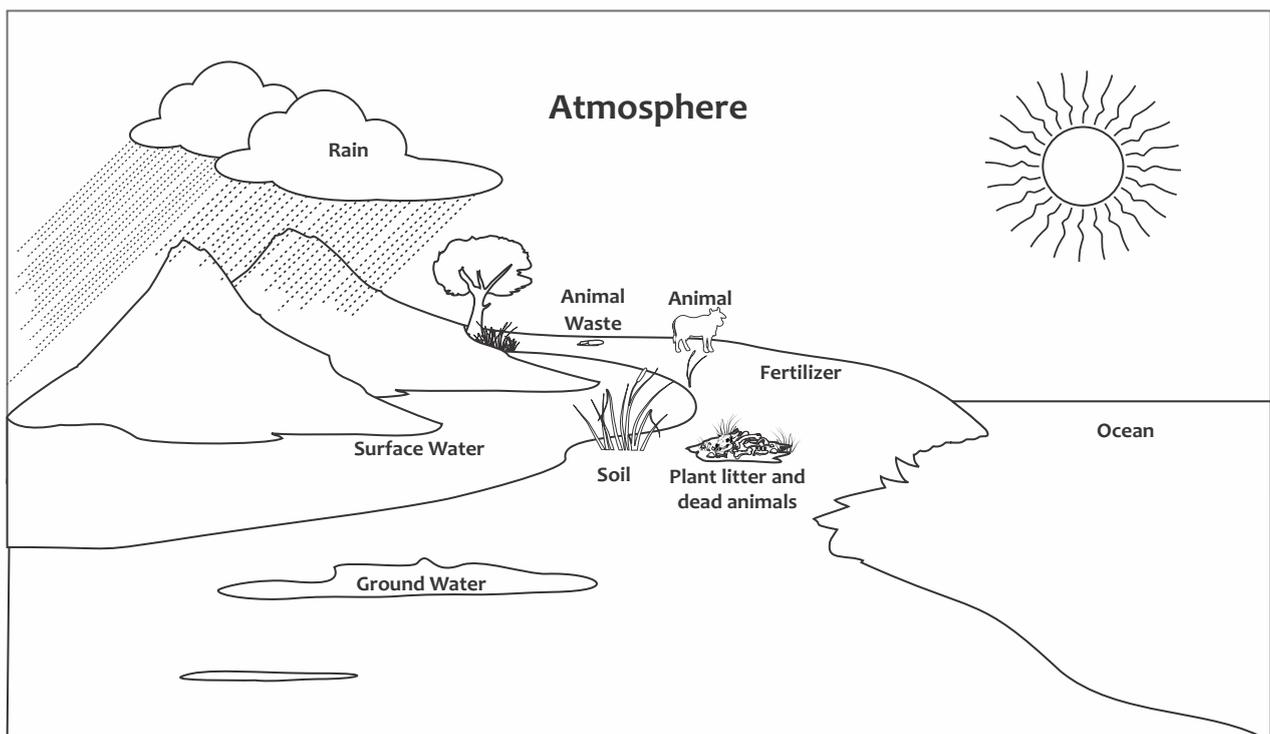
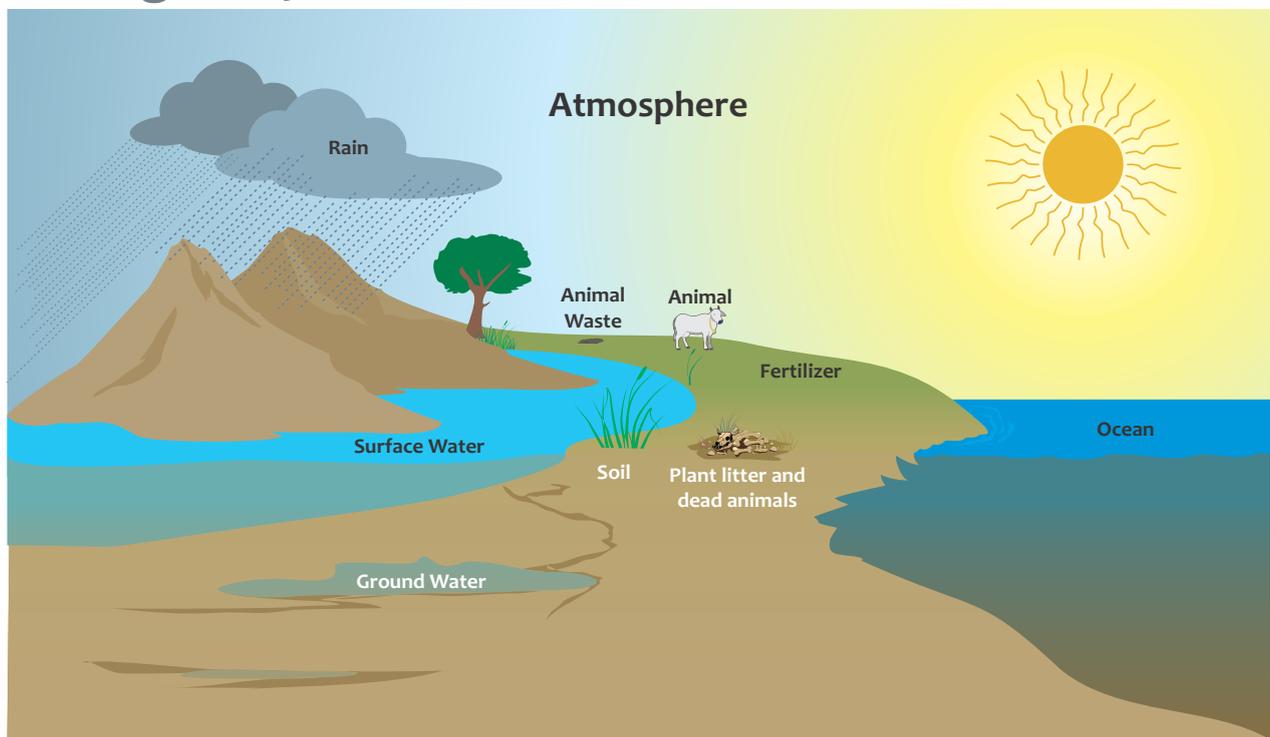
- Screen the film, Nitrogen Cycle | It's AumSum Time to depict to students the importance of the nitrogen cycle.
- Provide students with worksheets of the nitrogen cycle. Ask them to label the same and complete the representation of arrows to indicate the flow of nutrients through this cycle.
- Check out <https://betterlesson.com/lesson/640166/exploring-the-nitrogen-cycle> .
- Assist students to understand that all waste in nature whether it is dead and decomposing matter from both plants and animals undergoes a decomposition process and becomes available for use again in the nutrient cycle.
- Discuss and emphasize to students that there is no “waste” in nature.
- Lead the discussion to bring out a list of human made items which which do not decompose/ or take very long to decompose. The facilitator must make students understand that these items which do not decompose are human made and piling up as waste in nature.

Evaluation:

Ask students to write a letter to a friend explaining their trip through the nitrogen cycle. Ask them to Include information about (1) where they went, and (2) how they got to each destination.

Resource 1

Nitrogen Cycle Worksheet



Nature Walk - Decomposers

Lesson 2 Plan

INTRODUCTION

Decomposition is one of the most important processes by which nutrients are recycled in nature. It is the reason why there is no concept of waste in nature. The decomposition is carried out by decomposers that break down dead organisms or organic matter.

Decomposers are heterotrophic, meaning that they use organic substrates to get their energy, carbon and nutrients for growth and development.

The lesson familiarise the students with some of the common macro decomposers and initiates them in observing the process of decomposition happening all the time around them.

Objectives:

Students will be able to

- identify some macro decomposers.
- provide examples of some macro decomposers.
- describe the importance of macro decomposers.

Eco-Schools Steps: Audit, Curriculum linkages, Inform and Involve

Curriculum Linkage: Science/ Environmental Studies/Social Science



Eco-Schools

13-16
Years

Time required:

- **Classroom Session 1:** 90 minutes to set the context and brainstorm with students followed by Nature Walk to identify decomposers and sketch some of these.
- **Classroom Session 2:** 45 min for classroom interaction wherein students display sketches of the different decomposers each of the groups came across and a wrap up discussion by the teacher.

Resources Required:

- Gloves, shoes, rake/ stick and other safety equipment for going through a compost pile/ leaf litter.
- Resource - 2 (Macro decomposer reference chart)
- Resource - 3 (Decomposer sketch sheet).
- Magnifying glass



Activity

Classroom session 1

- With the background of importance of cycling nutrients in nature, the teacher should introduce students to the importance of decomposers.
 - Decomposers are significant to the ecosystem as they recycle nutrients after the organisms. These nutrients are then released into the ecosystem and available again for use.
 - Decomposers play the role of recyclers in the ecosystem.
- Brainstorm with students to help them recall and identify some of the macro decomposers they are already aware of.
- Introduce students to some more macro decomposers. The macro decomposers reference chart could be used as an example. You can prepare your own chart as per your region.
- Divide students into groups of 4-5 members for the nature walk. Assign different areas to different groups.
- Students should be guided to carefully go through the leaf litter or a pile of compost using a rake/ stick and study and sketch the different types of macro decomposers that they come across. A magnifying glass would be a useful tool.
- Guide the students to use the macro decomposer reference chart as a reference for identifying some of the decomposers that they come across. (Resource - 2)
- Ask students to use the decomposer sketch sheet for this purpose.

Classroom session 2

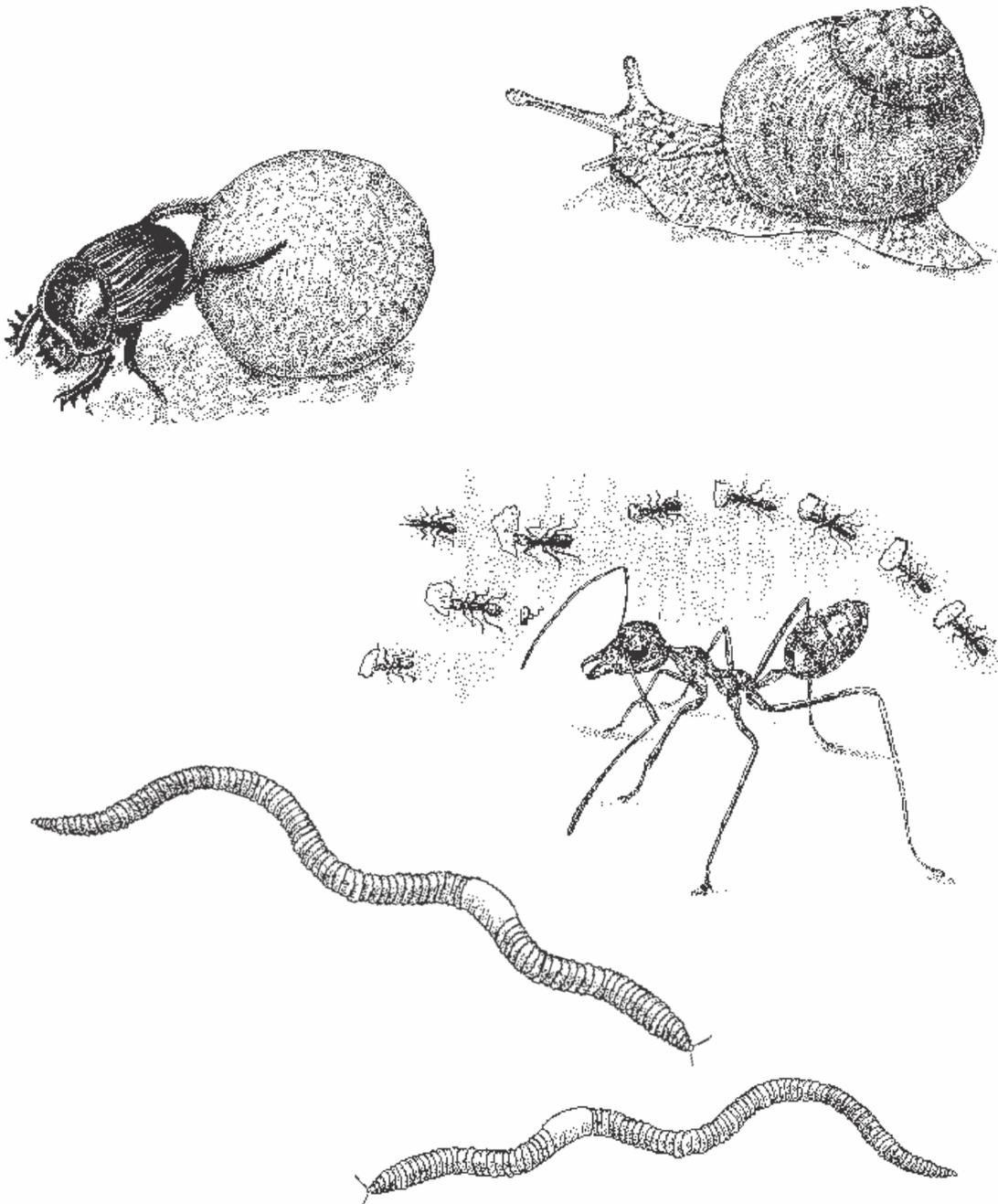
- Facilitate students to consolidate the different types of macro decomposers they came across during the nature walk.
- Ask the students to label the different macro decomposers by making use of the macro decomposers reference chart.
- Facilitate a classroom discussion following the nature walk to help students list the different types of non-biodegradable items they came across and whether they decomposed.
- Student sketches, prepared during the nature walk should be displayed on the Eco-Schools bulletin boards.

Evaluation:

Conduct a quiz to understand whether students are able to identify the different macro decomposers.

Resource 2

Macro decomposers reference chart



Resource 3

Decomposer sketch sheet

Cross Country Decomposers



INTRODUCTION

The lesson is designed to conduct an enquiry in the process of decomposition and factors that affect it. The rate of decomposition is dependent on the quality of organic matter and environmental conditions. Organic matter with higher concentrations of nutrients decomposes at a faster rate. Soil temperature and moisture content are very important factors affecting decomposition rates. At favorable moisture conditions, increasing temperature results in an exponential increase in decomposition rates.

Objectives:

Students will be able to

- plan and conduct a simple investigation - related to decomposition.
- gather and analyze the data, and frame their conclusion/explanation.
- communicate results of the investigation and explanations with students from other countries.
- communicate the findings of their research in the form of an article (suggested for YRE students).

Eco-Schools Steps: Curriculum linkages, Environmental review, Action Plan, Monitor and Evaluate, Inform and Involve
Curriculum Linkage: Science/ Environmental Studies/Social Science



Time required/ Duration:

- **Classroom Session 1:** 45 minutes to set the context and discuss with students the process of decomposition.
- **Group Assignment 1:** 4-5 weeks for response from the counterpart school. Two hours for consolidating, analysing and discussing the findings subsequent to the response received from the counterpart school.
- **Classroom Session 2:** 45 minutes for classroom interaction for consolidating, analysing and discussing subsequent to the response received from the counterpart school.
- **Group Assignment 2:** Three to four hours over three days for home based assignments for compiling and disseminating student articles.

Resources Required:

- Open space for conducting the investigation or similar sized earthen pots or other containers with equal quantities of similar type of soil placed in them
- Digging implements like - Stick/shovel/spade
- Different types of materials to check the rate of decomposition.
 - eg., those which decompose: vegetable peels, leaves, left over food, etc
 - eg., those which do not decompose: plastics, metal bits, cigarette butts, etc.
- Soil thermometer, stationery - books, pens, etc
- Resource - 4 (Decomposition - data collection sheet)
- Internet



Activity

Pre activity task for teachers/ facilitators

- With the help of your Eco-Schools/YRE National Operator, teachers should initiate the process of selecting a counterpart school in another country. This exercise of finding a counterpart school could take a few days to a few weeks.

Classroom session 1

- Set the context and brainstorm with students - the nature of things that decompose on their own.
- Ask students to make two lists of materials - those which decompose naturally and those which do not decompose.
- Assign students into groups. Group size of 4-5 students work best.

Group Assignment 1

- Student groups work over a period of 4-5 weeks to execute their investigation.
- Assign to different groups material which decompose and those which do not.
- Communicate to your counterpart school the materials selected for the experiment, this would help give better results.
- Students bury the material in soil and record their observations including sketches over a period of 4-5 weeks. Teacher should facilitate here that students put in only one type of material into a single pit.
- An exemplar resource 4 (data collection sheet) has been provided to record observations related to decomposition.

Classroom session 2

- Discuss findings in class - materials which decomposed and which did not, those which decomposed faster compared to others.
- Discuss the factors that affected the rate of decomposition.
- Share findings of your work with the counterpart school.
- Classroom interaction for consolidating, analysing and discussing subsequent to the response received from the counterpart school.

Activity

Group Assignment **2**

As part of this groups take up the assignment of investigating an issue related to waste/litter or a live project with scope of impact can be reported in the form an article or in form of a photo story (2-3 working days should be provided to student groups to accomplish this task):

- Students should continue to work in groups and report one article per group.
- The article should cover the purpose of taking up the short research, the differences in their findings if any.
- Ask the student groups to share their articles to create awareness through the school social media page or share the same during an assembly in the school, etc.

- For article: Refer Lesson Plan 1 from chapter “Learning to be an Environmental Journalist”

- For photo: Refer Lesson Plan 4 from chapter “Learning to be an Environmental Journalist”

Evaluation:

Ask students to list indicators that shows that decomposition is occurring and identify factors on which the rate of decomposition depends.

Resource 4

Data collection to measure decomposition

Material under investigation: e.g Vegetable peel						
Time	Observable changes in the material considered for investigation					Sketch of how the material looks
	Weight	Height	Temperature	Change in smell	Change in appearance	
Prior to burying						
Week 1						
Week 2						
Week 3						
Week 4						
Week 5						

References

<https://www.youtube.com/watch?v=HOprt8BRGtK>

<https://earthref.org/SCC/lessons/2010/biogeochimistry/nitrogen-carbon-cycles/>

Waste Management

Before you Begin

What is waste?

Eight million tons of plastic waste ends up in sea every year. To put it in perspective, a blue whale weighs 120 tons = 44,000 blue whales.

Estimation of waste generation and understanding its composition are important information for management of waste as this information influences the designing of waste collection and handling facilities, understanding its management and safe disposal. The information also raises awareness of waste being produced at home and what individuals can do to minimize waste and adopt practices like segregation, reuse and composting to support the waste management systems in their towns and cities.

What is a survey?

“Survey” is a method of collecting information via email, telephone or in person from a particular group of individuals which generally represents a fraction of the population being surveyed. The information thus collected is usually called data (Sarantakos, 1998).

Surveys are used by varied people to collect information pertaining to different aspects. Surveys can be administered in two ways - either as a structured interview, during which the respondents are asked questions directly, or as a questionnaire, which the participant fills out on his or her own. Each of these methodologies has its own advantages as well as limitations. The questionnaire for instance produces quick results and is inexpensive; however it is limited by the understanding of the respondent; who may leave the questions unanswered, if not understood.

Undertaking surveys is a pedagogical tool to sensitize students on the issue of waste, increase their understanding and encourage them to look at strategies to address the problem and give the experience of waste management through planning and establishing waste management practices or system in their school.

Waste surveys in the school will help assess the type and quantity of waste produced/ generated in the school. It will help understand the current system of collection, handling and disposal. The survey will help plan appropriate actions.

Waste survey at the community level will help students understand the waste management systems, the role of local municipality in managing waste from any town/ city and how citizens can help the systems work smoothly and efficiently. There are different means of collecting this information.

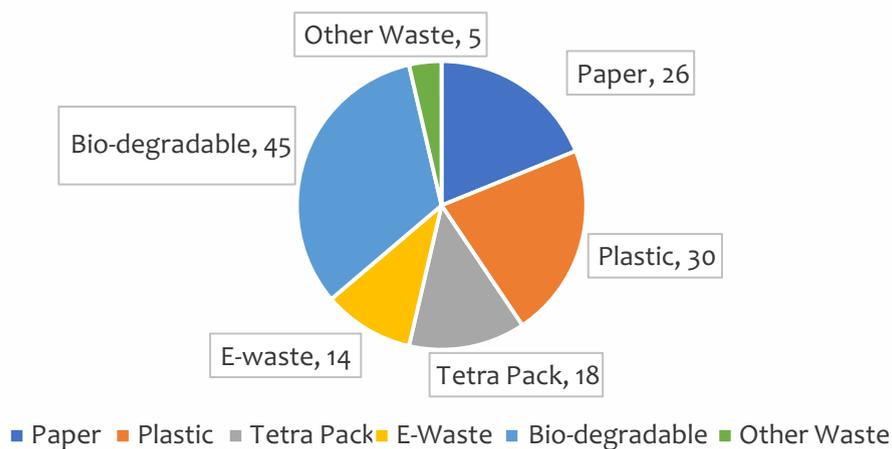
These include assessments, by measuring or assessing the different volumes of wastes generated, questionnaires or other means of conducting surveys.

In order to get the most out of the information (data) collected from surveys, it is important to analyze and interpret the same.

What is 'data' and the need for data representation?

Data is a collection of facts, such as numbers, words, measurements, observations or even just descriptions of things. Data representation, can be done using different methods; tally marks, graphs and pie charts are few of the methods which will be useful for students. Graphs of different types (bar graphs and pie charts) can be used in different situation and help to visualize and compare different pieces of data for ease of understanding and decision-making.

Graph representing waste management in Kgs



Plastic Waste: facts and figures

How much plastic enters the ocean every year ?



1096
Eiffel
Towers



24
Empire State
Buildings



44,444
Blue
Whales



30,180
heaviest sumo
wrestler in history,
Yamamotoyama
Szūb

Source : International Environmental Technology Centre (IETC)
Osaka, Japan

Understanding Waste

Lesson 1 Plan

INTRODUCTION:

We do understand that managing the waste that humans are creating as part of different activities has become a daunting task today. It will help reduce waste if we “extract the maximum practical benefits from products and generate the minimum amount of end waste”. Some of these principles are of utmost importance when we look at waste management.

- REFUSE material or products like disposable plastic whenever and wherever possible.
- RETHINK before creating waste, or think of alternative products for reducing waste.
- REDUCE to limit the amount of waste one creates in the first place. This includes buying products with less packaging.
- REUSE something again that you would normally throw away (eg. Glass jar for food or plastic bags for bin liners.)
- RECYCLE products. This is only recommended when reducing and reusing are not possible.

Eco-Schools Steps: Audit, Curriculum linkages, Inform and Involve, Evaluation and Monitoring
Curriculum Linkage:
Science/ Environmental Studies/Social Science



9-12
Years

This lesson plan will introduce students to the principles of waste management. Through a reflection of what they used and the waste they created, the lesson plan will enable students to rethink prior to creating waste. It looks at providing a hands-on experience to students in data collection through surveys. It also encourages students to interpret and represent the data. The learning processes include hands on engagement, classroom interaction, group work, analysis of responses and communicating about the topic through an article.

Objectives:

Students will be able to

- explain what constitutes waste.
- identify ways to handle the problem of waste.
- realize the importance of managing waste.

Time required/ Duration:

- **Classroom session 1:** 45 minutes to get students to classify different things they use and then introduce the concept of waste. Further introduce students to the concept of R's = Refuse, Rethink, Reduce, Reuse and Recycle.

Resources Required:

- Student writing material including notebooks and pen.
- Copy of Resource 1 - Understanding waste Management Principles.



Activity

Classroom session **1**

- Ask the students to make an individual list of all the things they used on the previous day. The list should include everything including toys, food, paper napkin, plates, notebook, clothes, pencil, etc.
- Ask the students to categorize these things and tabulate them into things that can be used again or were disposed.
- Discuss with students that once we find no ‘use’ for any particular “thing” it tends to become ‘Waste’. Introduce the concept of what is waste and highlight to students what might be waste for one person may not necessary be waste for another person.
- Introduce students to the concept of Refuse, Rethink, Reduce, Reuse and Recycle.
- Ask students to go through the list of things under “was disposed” and see if they can categorize them into one of the following Refuse, Rethink, Reduce, Reuse and Recycle using the table in resource 1 (Understanding Waste Management Principles). Emphasize to students that by doing this, they are helping reduce the “waste” generated.
- Randomly ask some students to read out their individual list and discuss.

Evaluation

How and why students have classified some will help assess whether students have understood the concept of waste, the need to manage waste as well as the principles of managing waste.

Resource 1

Understanding Waste

Sl. No.	Things used	Can be used again (Yes/No)	Was disposed	Take a re-look at the "Was disposed" list and see if you can instead classify it as a possible alternative into one of the following				
				Refuse	Rethink	Reduce	Reduce	Recycle

School Waste Audit



INTRODUCTION:

A waste audit is an analysis of waste stream in a place. A waste audit as a pedagogy help the students understand and determine the amount and types of waste that are generated. Information from these audits help to determine how you can reduce the amount of waste that is generated. It can identify the types of recyclable materials and waste and how much of each category is recovered for recycling or discarded.

Objectives:

Students will be able to

- undertake an audit to gather data pertaining to different types of waste generated in school.
- record data and find out the quantity of waste generated over a period of time.
- analyze, interpret and represent the data.
- prepare a plan and establish a waste management system.

Eco-Schools Steps:

Audit, Curriculum linkages, Evaluation and Monitoring, Inform and Involve

Curriculum Linkage:

Science/ Environmental Studies/Social Science/ Numeracy and Mathematics



9-12
Years

Time required/ Duration:

- **Classroom Session 1:** 45 minutes classroom based analysis of the data gathered and representation of the same on the Eco-Schools bulletin board.
- **Group Assignment 1:** Ten hours over two weeks provided for undertaking the waste audits within the school.

Resources Required:

- Writing material including notebooks and pen.
- Resource 2a (School Area and Type of waste generated) and 2b (Type and Quantity of waste generated).
- Resource 2c (Data Collection and Representation).



Activity

Classroom session 1

- Initiate a background discussion to (this could be done as a quiz to understand if students know what types of waste is found in different locations of the school)
 - set the context for understanding different types of waste generated, particularly in their respective school.
 - the importance of undertaking surveys with regards to the waste generated.
- Divide the class into groups of 3-4 members.
- Guide students to read Resources 2a (School Area and Type of waste generated) and 2b (Type and Quantity of waste generated).
- Discuss the resources.

Group Assignment 1

- All classrooms and other facilities of the school where waste is generated should be surveyed by student groups as part of the audit.
 - separate audits for individual classrooms, should be done using Resource 2b.
 - audits for other areas in the school including kitchen, laboratory, school office, garden and other common facilities use Resource 2a.

Classroom session 2

- Data gathered from all the classrooms and other facilities audited should then be added to give the cumulative figure for all the classrooms.
 - Facilitate students to represent the data in any one of the following forms: graphs, pie charts or pictographs. Resource 2a, 2b and 2c (Data Collection and Representation)
- Display the represented data on the Eco-Schools notice board to create awareness among the school community.

Evaluation:

A reflection with students on the findings of the survey could help understand whether students have understood the source of the different types of waste.

Resource 2

Resource 2a

School Area and Type of waste generated

Area	Type of waste	Quantity generated (in no. or weight)
Class rooms	Paper	
	Pencil Shavings	
Staff rooms	Chocolate wrappers	
	Paper	
	Refill	
School Office and Principal's room	Paper	
	Other	
School Kitchen/ School Canteen	Wet waste including vegetable peels and left over food	
	Packaging material	
School Dining hall	Other	
School craft room		
Playground	Leaf litter	
Garden	Other	
Library		
Laboratory		

Resource 2b

Type and Quantity of waste generated

Classroom: 1 (3rd standard B section)

(similar tables will have to be filled for different classrooms in the school)

Sl. No.	Type of waste	Mon	Tue	Wed	Thu	Fri	Sat	Total
1	Paper							
2	Pencil Shavings							
3	Food waste							
4	Chocolate							
5								

Resource 2c

Data Collection and Representation

What is a Data?

Data is a collection of facts, such as numbers, words, measurements, observations or even just descriptions of things.

Importance of Data visualization?

- Data handling helps in analysing the data collected in various context and for patterns and generalities within them.
- Data interpretation helps to analysing the data, segregate them in certain order, visualize them in the form of graphs and compare them between different pieces of data.
- Data interpretation also helps us to understand the frequency of maximum and minimum of data present.

Different ways of representing an information.

We can represent data or information in many ways. Data can be represented numerically in decimals, percentages and fraction. All the three representation means the same.

Example:

$\frac{1}{2}$ is equivalent to 50% which is also equivalent to 0.5

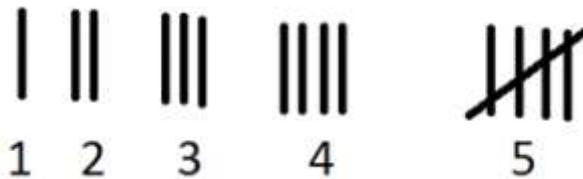
$\frac{1}{4}$ is equivalent to 25% which is also equivalent to 0.25

Data can also be represented pictorially using Graphs. It can be pictorially represented as a tally, Pictogram, Bar graph, Flow charts, Pie chart, leaf chart etc. Different types of graphs can be used in different situation. Graphs are picture representatives for 1 or more sets of information and how these visually relate to one another. Representing data pictorially will help the students visualize the data.

Tally:

Tally chart is one of the ways of representing data. It contains the details that need to be represented as a graph and it's frequencies. (Frequencies are details about the numbers of times the data is present or occurred.)

To represent data in Tally:

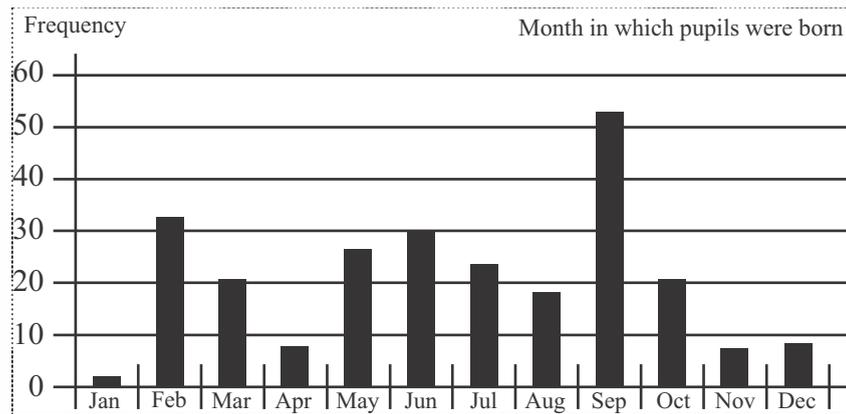


To represent a number 7 :

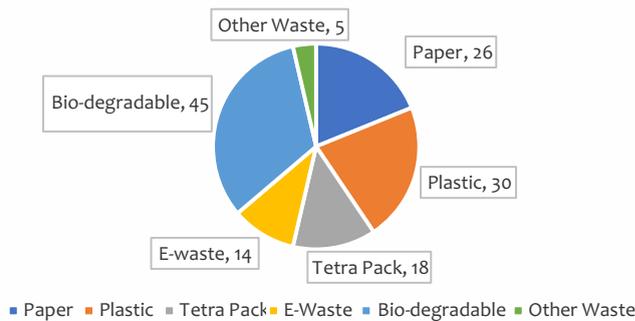


Bar Graph:

It is used to compare data which are formed into different categories and then compare with number of occurrences



Pie Chart



*Graphs & Charts can be used for representing the data that is collected and compiled by the students.

Advantages

- Allows easy comparison of parts with whole

Disadvantages

- At times tedious to calculate the sector angles
- The actual frequencies are not shown and need to be obtained by interpreting the chart

Pictogram

Advantages

- Can be made visually attractive
- Pictures make 'topic' clear

Disadvantages

- Hard to draw
- 'Fractional' pictures difficult to interpret

Data Representation in Eco-School Programme

- Data collected as part of the environmental review can be represented in the form of bar graphs, fractions, percentage, etc.
- Students will be able to apply mathematics concepts they study.
- Data collected when interpreted well, will help put in place a stronger action plan for implementation at the school level.
- Data can also be collected subsequent to the implementation of the action plan. The comparison of the data prior to and after the implementation of the action plan will help in evaluating the success of the action plan.

Household Waste Survey



INTRODUCTION:

The lesson plan engages students in the process of collecting information through surveys. The information collected is to do with household waste management, which will sharpen their understanding on the extent of the problem. Students will also be encouraged to analyse and represent the information collected as part of the surveys.

Objectives:

Students will be able to

- undertake surveys to gather data pertaining to waste management and disposal practices followed by individuals and households.
- Analyse and interpret the data collected; represent and display the same.

Eco-Schools Steps: Audit, Curriculum linkages, Evaluation and Monitoring, Inform and Involve

Curriculum Linkage: Science/ Environmental Studies/Social Science/ Numeracy and Mathematics



Resources Required:

- Students writing material.
- **Resource 3:** Household level survey – questionnaire

Time required/ Duration:

- 90 minutes (spread over two classes of 45 minutes each) for data analysis and representation.



Activity

Classroom session 1

- Initiate a background discussion to
 - Explain to students the importance of collecting information through surveys and then representing the data collected in different ways with regards to the waste generated.
- Divide the class into groups of 3-4 members for conducting the survey.
- Discuss the survey format given as resource.

Group Assignment 1

- Student groups survey 15 - 20 households over 2 weeks.
- Resource 3 could be used or modified for the survey.

Classroom session 2

- Provide students 45 minutes of classroom interaction to discuss and analyse their finding.
- Provide students with 45 minutes of classroom based work. Students should represent the data gathered and display the same on bulletin board as part of Inform and Involve. YRE students can share this as an article or photostory on different media.
- As part of survey interpretation students could analyse people's practices towards segregation and disposal of waste.

Resource 3

Household level survey – questionnaire

Survey Date:.....

Name of Surveyor:.....

1. Name of Municipality.....
2. Name of Neighborhood/ locality.....
3. Name of the head of the House Hold (HH).....
4. Educational qualification of the head of the HH.....
(a) Illiterate (b) Primary Schooling (c) Secondary Schooling (d) College or Higher
5. Profession of the head of the HH.....
(a) Government employee (b) Private employee (c) Business/Entrepreneur
(d) Student (e) Housewife (f) Retired (g) Other
6. Monthly income/expenditure:.....
7. Household family size:.....
8. Do you agree if the waste is not disposed properly, it can pollute the environment? Y / N ;
If yes, identify the causes/reasons for some of these problems
(a) As there is no dustbin nearby, wastes are disposed anywhere and this creates a nuisance.
(b) Wastes are not collected regularly.
(c) Wastes are left around the dustbin.
(d) Wastes are left in the drain.
(e) Wastes are left on the road.
9. Who disposes your household waste?
(a) Servant (b) Family member (c) Anyother person
10. Where is the household waste disposed?
(a) In the dustbin (b) By the side of the road
(c) In an empty space near the house
(d) waste collector from the municipality do the door to door waste collection
14. How much are you currently spending for waste disposal per month?
15. Satisfaction level about the present municipal waste removal system:
(a)Very good (b) Good (c) Ok/medium (d) Not satisfactory
16. How often do you dispose of your household waste?
(a)Every day (b)Once every two days (c) Once every three days

17. How do you dispose your household waste in:
 (a) Polythene /plastic packet (b) Small bucket (c) Any other container
18. Generally, when do you dispose of your waste?
 (a) No definite time (b) Between 6am to 6pm (c) After 6pm
19. How often does the city municipality collect the waste?
 (a) Everyday (b) Once in two days (c) Once in three days (d) Irregularly (e) Don't know
20. Which system do you prefer for removal of your household waste?
 (a) A collector will collect the waste from the house. (b) The collector will come to a certain place at a certain time, you will give him the waste. (c) You yourself will dispose the waste in the dustbin. (d) You will keep your waste container at a certain time by the roadside and the collector will collect it from there.
21. Rank your priority (from 1-4, with 1 being the least on the priority list):

Facilities	Priority
Water supply	
Sanitation	
Solid waste management	
Drainage	

22. What do you feel is the most common type of waste generated at your home?
23. Would you like to dispose waste from your household daily?
24. What types of wastes are you willing to store for a few days
 (a) Wet waste (b) Packaging material including milk covers and other food packaging
 (c) Batteries (d) Household sanitary waste (e) Electronic waste
25. Would you segregate your household waste because
 (a) It's your responsibility (b) It's mandatory (c) It can generate some income
26. What types of waste are you segregating and selling?
27. Do you know where the household waste is taken?
28. Are you willing to participate in the exercise to assess the volumes of waste produced for different categories?

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Litter

Before you Begin

The Merriam Webster dictionary defines litter as “trash, waste paper, or garbage lying scattered about”, and waste as “an unwanted by-product of a manufacturing process, chemical laboratory, or nuclear reactor (these could be toxic, hazardous or nuclear waste)”. Waste is also defined by Merriam Webster as “refuse from places of human or animal habitation: such as garbage, rubbish, excrement or sewage”.

In general we can understand litter as waste “littered” or “thrown” around. Litter can thus be described as waste products that have been disposed improperly, without consent, at an inappropriate location.

Litter creates toxins and pollutants that are harmful to our environment and animals. Discarded garbage clogs waterways, effects soil, and may remain in landfills for years. Litter may harm the environment and the animals which inhabit it. Animals may ingest pieces of litter like plastics, cigarette butts, or sometimes even be strangled by it. Litter is also a huge problem as it adds to the annual costs of a municipality if not properly disposed in the first place. Litter today has become a problem both on land and in our waterways including oceans.

Litter research by Keep America Beautiful (<https://www.kab.org/>) has identified seven primary sources of litter:

1. Motorists (debris thrown out of windows by passengers in vehicles including cars, buses, trains, etc).
2. Pedestrians (individual littering of packaging, beverage containers, cigarettes butts, etc.).
3. Household trash on the roadside (leaving lids off trash/ garbage cans; overflowing trash/ garbage cans; unbundled or covered paper that blows, etc.).
4. Dumpsters or large garbage cans used by businesses (overflowing or uncovered trash that invites blowing and spreading).
5. Loading docks/ bays (loading areas in buildings where goods vehicles are loaded and unloaded. Commonly found in commercial and industrial buildings including warehouses).
6. Construction and demolition sites (debris in and around sites and blown by wind or carried by rain).
7. Uncovered trucks (trash/ garbage falling or blowing off open garbage vehicles).

Keep America Beautiful studies on where pedestrians and motorists litter most revealed the following:

- Special event venues - fairs, concerts, game/ matches or other events that attract a large number of people.
- Roadways and highways – road sides, on/off ramps, median strips, and rest stops
- High traffic areas – fast food businesses, convenience stores, picnic or play grounds, stadiums, and other areas with a lot of foot fall.
- Transition points – places where someone stops eating, drinking or smoking before proceeding, such as entrances to buildings, train platforms, and bus stops.

Some of the above reveal that litter is a problem associated more with the behaviour and attitude of people. Different approaches could be adopted to look at the litter problem. Awareness and education in schools, action by different target groups including students and general public and use of different platforms for promoting information. Social media is one such platform which has been looked at in the following lesson plans for creating awareness and taking action with respect to the “litter” problem.

Merriam-Webster dictionary defines social media as "Forms of electronic communication (such as Websites) through which people create online communities to share information, ideas, personal messages, etc." Social media could be utilised as a platform to create and share information. There are many different and popular social media websites like Facebook, Google+, Instagram, Pinterest, Snapchat, Tumblr, Twitter, WhatsApp, and YouTube to name a few. Some examples of how social media platforms have also been used popularly to promote information and run campaigns associated with littering are illustrated below:-

Example 1

The Glasgow city council site <http://www.zerowastescotland.org.uk/litter-flytipping/social-media> describes how social media sites could be used to prevent litter and fly tipping (used and defined in some countries as the 'illegal deposit of any waste onto land that does not have a licence to accept it'). The Environment Protection Authority, Victoria site <http://www.epa.vic.gov.au/get-involved/report-litter/report-litter-app> encourages people to report about Litter with the help of a mobile App.

Example 2

Is a case example of how Product Design students from the Aston University were engaged in a project to design an innovative intervention to prevent littering on Birmingham's streets <http://www.aston.ac.uk/news/releases/2016/october/-product-design-hubbub/>. Students first researched and understood what motivates people to litter. They moved beyond the classroom to go and observe the littering problem in the city. Working in teams, students had to design a solution that has the potential to change behaviour. Ideas ranged from brightly coloured, seasonally shaped bins that would be placed in the city at key times of year such as Christmas and Easter, to large sticky markings on the floor which resembled chewing gum, and stated facts about the cost of chewing gum disposal. The ideas were implemented in association with a local NGO Hubbub.



Litter Pick



INTRODUCTION:

Taking positive actions help student to engage with the problem and understand its various dimensions including the scale and how individual behaviors contribute to the problem or solutions. In the process of taking such action they also reflect on their behaviours. The litter pick, will involve to collect litter, sort and categorise different types. Through discussions built in as part of the lesson plans it also encourages students to understand the most commonly found litter, whether it is harmful or not and to find some solutions to littering.

Objectives:

Students will be able to

- differentiate between litter and waste.
- identify different types of waste material littered around.
- categorise and make an inventory of different types of litter found.

Eco-Schools Steps: Audit, Action plan (strategize and implement the litter pick); Inform and Involve

Curriculum Linkage: Science/ Environmental Studies/Social Science



Time required/ Duration

- **Classroom session 1:** 45 minutes (10 minutes for background introduction, 30 minutes for brainstorming and 15 minutes for group discussion and conclusion)
- **Assignment:** 30 minutes for litter pick
- **Classroom session 2:** 45 minutes for classroom interaction (30 minutes for developing an inventory)

Resources Required:

- Gloves and other safety equipment for litter pick
- Sacks for collecting litter
- Dedicated display board



Activity

Classroom session 1

- Introduce students to the difference between litter and waste.
- Brainstorm with students and ask them to list different types of waste that they see “littered” around. What could be the reason for littering?
- Divide the students into groups and discuss and identify an area within the school or in the immediate neighbourhood where they could do a litter pick.

Group Assignment 1

- Divide the students in groups of 3-4 to participate in the litter pick.
- 30 min should be provided to the students to “litter pick” the identified location
 - For the litter-pick ensure students follow adequate safety - they should wear gloves and shoes and also carry sacks to store the litter.
 - It might be difficult to sort the litter while it is being collected. It is better not to attempt doing the same.

Classroom session 2

- Provide the initial 45 min for classroom interaction where in student groups will be provided time to first sort litter and then develop an inventory.
 - Guide the students to sort the collected litter into different categories - bottles, caps, cans, plastics, chocolate wrappers, etc.
 - Ask the students to make an inventory and represent the same graphically. This will be a good exercise to help develop in students numeracy skills and understand different forms of data representation (bar graphs, tally marks or others could be used for this purpose).
 - The charts developed by students should be displayed on the Eco-Schools bulletin board as part of inform and involve others in the school about “litter pick”.
- In the remaining 15 min, after students have developed an inventory, teachers should discuss different aspects surrounding litter with them.
- litter can be graded among most commonly found and not so commonly found.
 - Most harmful and least harmful.
- Discuss the impacts of "littering". Some lead question like Why do people litter? What are the impacts of litter? What are the common items found littered as part of the litter pick and possible ways of reducing litter can help in having a discussion.

Evaluation:

Assess the understanding of the students from inventories and representation of data graphically and their interpretation of results.

School Litter Survey



INTRODUCTION:

The lesson plan encourages students to participate in a litter pick. It engages students in group work to sort and categorise the litter collected and display the same on the Eco-Schools bulletin board. It encourages students to strategise and communicate the litter related problem and work towards behavioural change.

Objectives:

Students will be able to

- undertake a litter-pick and be able to identify litter hot-spots in the school.
- conduct a survey in school to find the reason for littering.
- prepare a strategy to prevent litter.
- develop a communication to change behaviour related to littering.

Eco-Schools Steps: Audit, Action plan, Monitor and Evaluate, Inform and Involve

Curriculum Linkage: Science/ Environmental Studies/Social Science



Eco-Schools

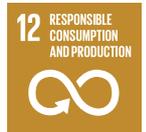
13-16
Years

Time required/ Duration:

- **Classroom session 1:** 45 minutes to set the context, brainstorm with students and identify locations for litter pick.
- **Assignment:** 45 minutes for “litter-pick” and litter survey (multiple groups work simultaneously).
- **Classroom session 2:** 90 minutes for classroom interaction, analysis and display subsequent to the litter pick and litter survey.

Resources Required:

- Gloves and other safety equipment for litter pick
- Sacks for collecting litter
- Resource-1 (Litter survey sheet)
- Dedicated display board



Activity

Classroom session **1**

- Through background introduction introduce students to the difference between litter and waste
- Discuss with students to identify different locations in school for the litter pick. Teacher should then divide students into different groups to simultaneously undertake litter survey in the identified locations.

Group Assignment **1**

- Two specific tasks need to be completed as part of this Group Activity
 - (i) **Litter Pick**
- 45 minutes provided for “litter pick” by students in the identified locations (simultaneously)
 - For the litter-pick ensure students follow adequate safety - they should wear gloves and shoes and also carry sacks to store the litter
- (ii) **Litter Survey**
45 minutes should be provided to students to undertake the litter survey in groups. Each group could interview a minimum of 4-5 members.

Classroom session **2**

- Back in the classrooms, help student groups to categorise and inventorise the different types of litter found by individual groups
Identify the most “littered” areas in school and also the most “littered” items
- Get students to graphically represent this inventory; the same should then be displayed on the Eco-Schools board.
- Encourage and guide the students to put together a strategy to reduce littering on the school campus
- Encourage students to develop communication material to create awareness about the impacts of littering. Communication material should also have messages to change behaviour of students towards littering.

Evaluation:

A re-survey with students over a period of time will help assess the frequency at which communications have to be made and what has been the impact of these communications on students.

Resource 1

School Litter Survey

1. I am out and need to dispose trash, I... (tick all that you think are appropriate)

- Drop it wherever I am
- Put it in a recycling bin
- Put it in a trash can
- Put it in my pocket until I find a place for proper disposal
- Leave it behind
- Other (please specify)

2. Is litter a concern to you?

- Yes
- No

3. If yes, why is litter of concern to you? (tick all that you think are appropriate)

- It looks dirty
- It is not good for human health
- It is dangerous to animals
- It is bad for the environment
- Other (please specify)

4. Why do you think littering occurs? (tick all that you think are appropriate)

- Inconvenience
- Habit
- No trash can nearby
- Someone else will clean it up
- Lack of awareness
- Other (please specify)

5. Where does litter end up? (tick all that you think are appropriate)

- Land
- River
- Sea/ Ocean
- Landfill
- Inside bodies of animals
- Not aware

6. What according to you is the most common type of litter found in our school? (choose one.)

- Plastic bags
- Chocolate/ candy wrapper
- Chewing gum
- Food wrappers
- Cans

7. Which locations according to you are the litter "hot-spots" of the school and Why?

.....
.....
.....

8. If there were enough dustbins, would you still litter?

- Yes
- No

9. Do you think you can do something to reduce litter in our school. Mention briefly.

.....
.....

10. What do you think is the most effective way to reduce/control litter?

- Education/Awareness campaigns
- Volunteer litter-pick
- Punishment
- Other (please specify)

11. Which are your favourite locations beyond the school that you would not like to become a litter "hot spot" and Why?

.....
.....

Packaging

Before you Begin

“Packaging” is “material” used to wrap or protect goods. Packaging as a technology is used for enclosing or protecting products for distribution, storage, sale, and use. Packaging is used in different industries including aerospace, beverages, chemicals, hospital, pharmaceuticals, food, to name a few.

Packaging is also used as a means to provide information (contents of packaging, ingredients, quantity, date of manufacture and expiry and cost of product to name a few) to consumers.

Packaging comes in different forms, in different sizes and uses different types of materials depending on the items or the products they are protecting. Packaging can be for a product as small as a tissue wrap for a burger or as large as a shipping container.

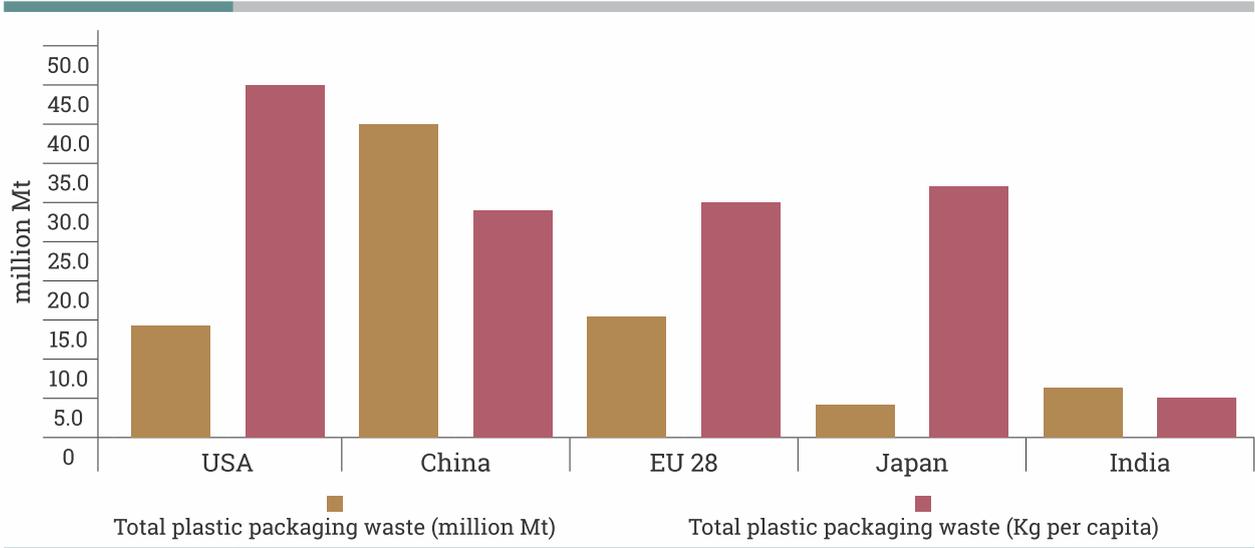
There are a number of benefits to packaging, some of these include

- barrier protection - packaging material serves as a barrier and protects the product from factors like dust, water, and other contamination.
- physical protection - is to protect the packaged product from dropping, shock, extreme temperature and vibrations to name a few.
- convenience - in terms of distribution, handling, stacking, opening and closing, reuse, recycling, etc.
- security - to increase safety in terms of tampering, theft, etc.
- sustainability - returnable and reusable packaging could be used a number of times prior to recycling.

As per Eurostat website, in Europe during 2015, 166.3 kg of packaging waste was generated per inhabitant in the EU (varying from 51.2 kg per inhabitant in Croatia and 222.2 kg per inhabitant in Germany). From 2006 to 2015, paper and cardboard was the main packaging waste material in the EU (34.8 million tonnes in 2015) followed by plastic and glass (15.9 and 15.8 million tonnes respectively).

As per UNEP, The single use packaging is one the biggest environmental challenge. Plastic packaging is mostly single-use, especially in business-to-consumer product, and a majority of it is discarded the same year it is produced. Nearly 50 percent of the plastic waste generated globally in 2015 was plastic packaging. Much of this packaging, including polystyrene and other plastics, does not break down quickly and when they are disposed in landfills, they create long-term environmental problems. The production of packaging uses natural resources including water, and electricity that has independent environmental impacts. By products of manufacturing are also a concern.

Plastic packaging waste generation, 2014 (million Mt)



Source: UN environment *singleUsePlastic_sustainability*

Understanding Packaging

Lesson 1 Plan

INTRODUCTION

The product packaging often has information about the content, price and quantity of the product, make it convenient to store and use the product and also tell us where the product was manufactured and how and by when it should be utilised. Packaging sometimes has important symbols like the recycling symbol, ingredients source (vegetarian and non vegetarian), hazards etc.

The lesson plan encourages students to understand packaging, its relevance and purpose and also the impacts packaging waste is creating on the environment.

Objectives:

Students will be able to

- identify different types of packaging material used for household products.
- list different types of packaging material available in the market.
- visualise different types of packaging material and sort these into different categories.

Eco-Schools Steps: Audit, Action Plan development, Evaluation and Monitoring, Inform and Involve

Curriculum Linkage: Science/ Environmental Studies/Social Science/ Numeracy and Mathematics



6-8
Years

Time required/ Duration:

- **Classroom session 1:** 45 minutes for the teacher to do a background introduction on packaging and for the colouring and circling activity.
- **Home assignment 1:** Four hours over a week for completing the packaging worksheet and to collect and bring back to their classrooms different types of packaging material.
- **Classroom session 2:** 90 minutes provided to students to develop a “display on packaging material”.

Resources Required:

- Resource Sheet 1 for identifying human-made packaging and packaging in nature
- Resource sheet 2 : Worksheet for listing different types of packaging material available in the market
- Different packaging material collected by students or teachers
- Dedicated display board
- Student’s stationery including colouring material (crayons/ colour pencils/ others)



Activity

Classroom session 1

- Start with a discussion introducing students to packaging. To get students to understand “packaging”, it will be useful to ask probing/ leading questions to students and work further based on the response received.
 1. What packaging is?
 2. What is the importance of packaging?
 3. What are the problems caused by different types of packaging?
- Hand over the colouring sheet on human-made packaging and packaging in nature to the students.
- Ask the students to colour objects which represent packaging in nature and circle those which represent human made packaging.

Home Assignment 1

- Ask the students to fill a worksheet on different packaging material based on the home survey.
- Collect some of these packaging material and bring it back to class along with the filled in worksheets. These packaging material will be required for Classroom session 2.
- Instruct students to fill in Resource 2 (Worksheet for Packaging material), based on the products which were purchased and brought home during the course of the home assignment.

Classroom session 2

- Review and discuss the worksheets completed by students.
- Ask the students to sort the representative packaging material brought back by students based on waste types (natural or human-made, which should be further categorised into paper based, metal, glass, etc.) and a Eco-Schools display board on packaging material should be developed by students.
- This board should be maintained for A month and will help to inform and involve students.

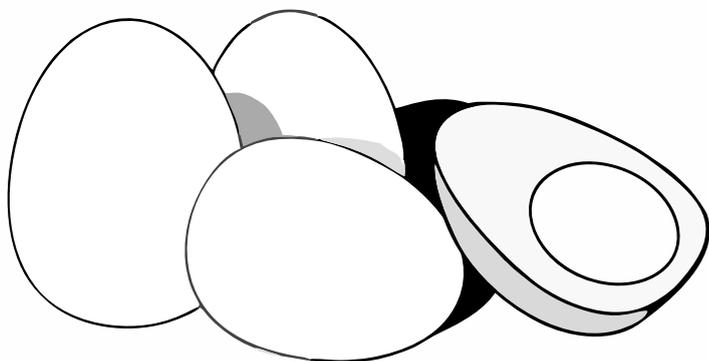
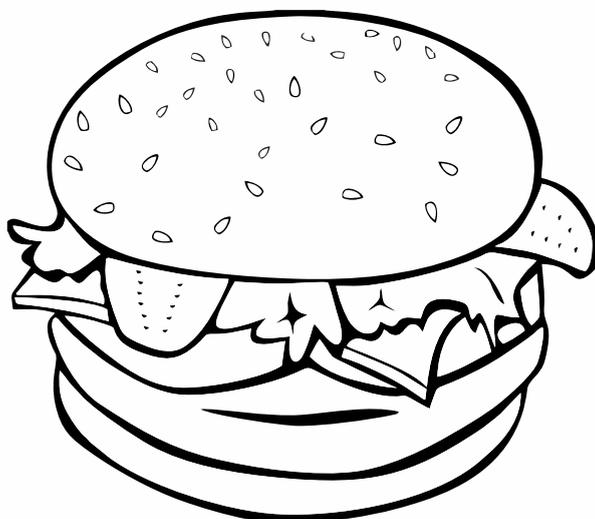
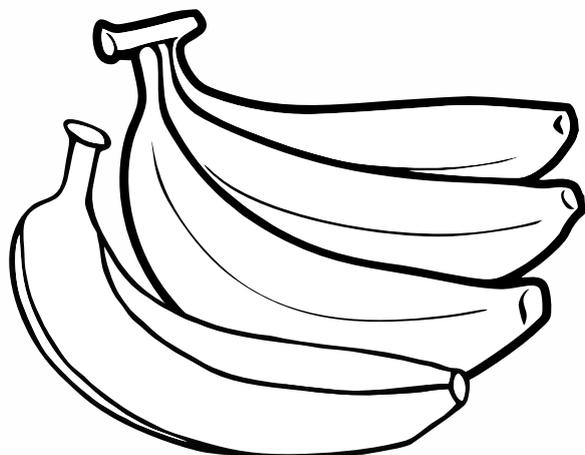
Evaluation:

Colouring the right objects will help teachers ascertain whether the students have understood natural and human-made packaging material.

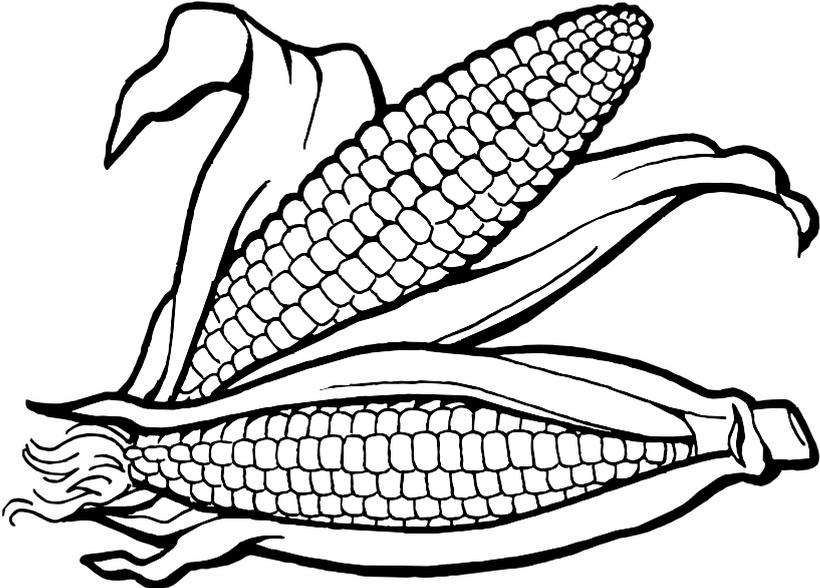
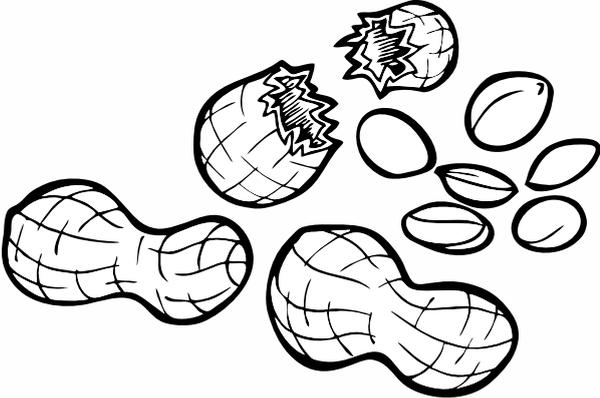
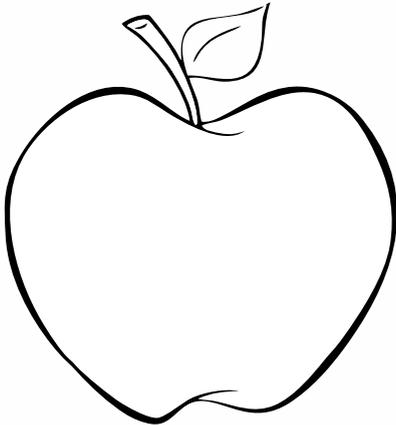
Sorting of packaging material for the display boards will be a good way to assess whether students have understood the concept.

Resource 1

Colouring Sheet



Resource 2



Smart Shopping Choices



INTRODUCTION

In any market, consumers decide what is sold to them in what quantities. Consumers by picking right can influence the producer in a big way. Advertising can manipulate consumers but a consumer who thinks critically with environmental consciousness can make lots of difference to shape the market.

The lesson plan take students through a process that would lay the foundation for values which can help them move from individual acts of consumption to broader changes influenced by collectives like any democratic processes that can lead to solving our environmental problems.

Objectives:

Students will be able to

- explain packaging waste has an impact on the environment.
- identify perspective and present consumers concerns about packaging waste.
- design and implement a campaign to address packaging waste.

Eco-Schools Steps: Audit, Action Plan development, Inform and Involve, Evaluation and Monitoring

Curriculum Linkage: Science/ Environmental Studies/Social Science/ Numeracy and Mathematics



13-16
Years

Time required/ Duration:

- **Classroom Session 1:** 45 minutes for the teacher to do a background introduction on the impacts of packaging waste on the environment, and how to go about conducting the consumer survey.
- **Group Assignment 1:** One week time provided to each student to undertake the Consumer survey; each student group to undertake survey with at least 4-5 consumers.
- **Classroom Session 2:** 90 minutes for consolidating and presenting the student surveys.
- **Classroom Session 3:** 45 minutes for brainstorming campaign ideas (skit/ musical) for promoting information about responsible choices and disposal of packaging material.
- **Group Assignment 2:** 15 days for implementing the campaign (3-4 times over 15 days).

Resources Required:

- Resource 4 (Consumer Survey Form)
- Writing material
- Materials for implementing the campaign



Activity

Classroom session 1

- Brainstorm with students examples of different types of packaging materials (cardboard, glass, wood, hay, leaves, plastic, etc) and thereby introduce to them the importance of packaging.
- Discuss and introduce to students the impacts created by packaging waste on the environment.
- Explain to the students about the survey to be undertaken by them in individually/in groups to find out what consumers feel are the impacts of packaging waste. Discuss the survey sheet prior to undertaking the survey.
- Discuss and guide the students on how to approach consumers requesting them to help complete the survey.

Group Assignment 1

- Provide students one week time to get responses to the Consumer Survey Form.
- The Consumer Survey Form has 20 questions, students should be informed that it might take about 30 minutes for respondents to complete the survey.
- Each group could interview a minimum of 4-5 members.

Classroom session 2

- Ask the students to tabulate the findings and organize the response received.
- Ask the students to analyse and present the results. This should be done through classroom based discussions and student groups should be encouraged to represent the results in the form of a infograph.
- The infographs prepared should be displayed on the Eco-Schools bulletin board.

Classroom session 3

- Based on the survey results guide the students to identify key messages to develop a campaign plan for creating awareness about packaging waste.
- As part of the campaign plan let the students choose their media like short skit (7-10 min duration should be ideal) or create a musical (about 7-10 min) addressing the problem and highlighting some solutions.

Activity

Group Assignment

2

- The skit or the musical prepared by the students should be performed by them in front places like a shopping mall to create awareness regarding packaging waste.
- Teachers might have to take permission from the mall authorities for the same.
- The awareness should be created a minimum of 3-4 times over the duration of 15 days. A video can be made of the performance and shared on social media.
 - For video: Refer Lesson Plan 5 from chapter “Learning to be an Environmental Journalist”

Evaluation:

Subsequent to the surveys teachers/ facilitators should be able to help students conclude the consumer opinion about impacts of packaging waste on the environment.

Campaign evaluation: some of the bystanders who watched the student performance should be asked what they felt regarding the same.

Resource 4

Consumer Survey Form

1. The survey should help assess what consumers feel about packaging?
2. The survey should help understand whether consumers are concerned about how packaging waste affects the environment.
3. The survey should help understand whether the consumer plans to take any action to reduce packaging waste.

Are you a consumer?	Yes	No
---------------------	-----	----

Name any 3 products you consume regularly

Do you think these products contain packaging?	Yes	No
--	-----	----

Name 5 different types of packaging material that you can think of

When you purchase milk, packaged in different forms like pouches, tetrapaks, or bottles, do you think of recycling any of these packaging	Yes	No
---	-----	----

Do you think these packaging materials to package milk are harmful to the environment?	Yes	No
--	-----	----

Why?

Do you think of packaging when you buy a product e.g. shampoo? Would you opt for:			
sachets	small throw away bottles	larger containers	

Do you think your choice of purchasing a shampoo in one of the above packaged forms can make a difference?	Yes	No
--	-----	----

Can you mention why and how?

When you shop for vegetables	would you buy fresh vegetables cut and cleaned vegetable stored in different packaged materials including plastic disposable trays, polystyrene trays, etc
------------------------------	--

Do you think your choice makes a difference? How and Why?

When you go shopping, would you care to carry your bag	Yes	No
--	-----	----

If No, choose one of the following:

- Do you go to a store and demand for a carry bag
- Do you think it is the responsibility of the store to give you a carry bag?
- Do you think it is your responsibility to take a bag with you when you go for shopping?

When you shop do you look for packaging which is made from recycled material?	Yes	No
---	-----	----

Do you look at the packaging for any of the following? Grade them from 1-5 in the order of your priority

Expiry date

Recycling symbols

Contents of packaging

Material of packaging used

Cost of the product

Offers like buy one get one free/extra content for free

Do you save packaging material for recycling	Yes	No
--	-----	----

How do you dispose different packaging items like plastic bottles, corrugated sheets, glass bottles, Tetrapak, Aluminium cans

Throw away as mixed garbage

Segregate for recycling

What kind of packaging material are you most likely to return for recycling?

Plastic bottles Corrugated sheets Glass bottles Tetrapak Aluminium cans

Why?

Do you think you must help reduce packaging waste	Yes	No
---	-----	----

Why?

Sustainable Consumption

Before you Begin

World consumption has expanded at an unprecedented pace in the twentieth century. Some benefits of this consumption have ensured people are better fed, housed and have a longer life span. However, increasing consumption that too at fast pace is undermining the environmental resource base. The report of the Sustainable Europe Research Institute (SERI), “Over Consumption? - Our use of the World's Natural resources” mentions that natural resources including materials, water, energy and fertile land are the basis for all life on land. However, humanity's rapidly growing consumption of these resources is causing severe damage. Our climate is changing, our fresh water reserves, fish stocks and forests are shrinking; fertile land is being destroyed and species are becoming extinct. In order to continue to thrive on this planet, our lifestyle will need to become more sustainable, so that we are able to protect our natural resource base and the fragile ecosystem on our planet.

The case examples highlight how consumerism is changing the way people look at resource consumption. It is important that individuals take responsibility for consuming goods and services in a sustainable manner.

In the age of convenience consumerism, we may waste as much as we consume. We may pay more for the packaging than for the product. There needs to be a shift in what and how much we consume; is it really a need or a want? What are the better alternatives to the packaging? If we do not address today's problem of overconsumption, the status of the natural resource base will only worsen and impact quality of life.

Case Example 1

A sustainable past

In the good old days, there was the cloth shopping bag. We took it to the shops hundreds of times till it was torn. We did not have the plastic bags to use once and throw away. We drank tea in china cups or steel tumblers; no paper cups to litter a place. We did not have soft drink fountains with their disposable cups, we used bottles instead. An empty milk powder tin remained on the kitchen shelf for years as a store for sugar or gram. Milk was bought in clean glass bottles which were returned the next day; no plastic pouch or cartons to be thrown into the bin the next day. We had handkerchiefs washed and rewashed till they were torn; no paper napkins to throw away. Babies wore clean cloth diapers (usually made from grandmother's old soft cotton sarees), washed and rewashed; no throwaway diapers. Those days we did not waste.

Case Example 2

New Plastic Economy

The Ellen MacArthur Foundation report “The New Plastics Economy” details the scale of the packaging waste problem. In 2013, industry produced 78 million metric tons of plastic packaging worldwide. Of that, 40 percent was landfilled and another 32 percent was “leaked” to the environment, polluting land and sea. Only 28 percent of the plastic, the report says, was collected for further use. Half of that was incinerated for energy. The other half was recycled.

Source:

<https://www.ellenmacarthurfoundation.org/programmes/systemic-initiatives/new-plastics-economy>



INTRODUCTION:

The lesson plans focus on present day consumerism of a household and understand the basic needs. The lesson plans students to focus on what they are consuming as a family and also as a student; get them to analyse whether they really “need” or “want” a particular product.

The Eco-Schools twinning programme could be used as a platform to do a comparative analysis of consumerism in two different countries.

Eco-Schools Steps: Environmental Review, Curriculum linkages, Inform and Involve

Curriculum Linkage: Science/ Environmental Studies/Social Science

Objectives:

Students will be able to

- identify individuals needs and wants.
- distinguish between needs and wants.

Time required/ Duration:

- **Classroom Session 1:** 45 minutes (10 minutes to set the context and brainstorm with students, 20 minutes for the countdown game and 15 minutes of classroom interaction to help sum-up the activity).

Resources Required:

- Resource 1 (Countdown - scenario)
- Writing material



13-16
Years



Activity

Classroom session **1**

- Give a background introduction and get students to discuss and understand different perspectives on sustainable consumption.
- Divide the students into teams of 5-6 players each. Tell them that each team represents a family.
- Tell students that they are going to play a game. Familiarise them with the rules of the game - i.e. play in teams and make appropriate lists for each scene after discussion.
- Now read out to the teams the countdown scenario. Make sure you read only one scene at a time. Ask students to be attentive when you are reading a scene and provide them adequate discussion time between scenes.
- At the end of each scene, ask students to make a list of the most essential things they would carry on from one scene to another - starting from 20 at the end of scene one and arriving at five at the end of the last scene. Each list should be made on a separate sheet to able to compare later.
- Facilitate groups to compare their original list with the final list of five things.
- Ask the students to compare the list of things - both the original twenty and the final five.
- Ask the students the criteria that they used to retain an item after each scene.
- Discuss what would be considered need and want.

Evaluation:

Ask the students, how they can differentiate a need from a want?

Resource 1

Countdown - scenario

Scene 1

Players are escaping from their home town because of a catastrophe. Each team represents a family. They may not be able to return to their homes or may not find their homes intact when they return. Each family is not allowed to take money. A family is only allowed to take 20 things from their homes before they leave. These things should help them start afresh at a new place. Which are the 20 things each family will choose to take?

Scene 2

Once the families have collected their belongings and moved to the vehicle which will transport them to a safer location, families realise the vehicle is overloaded and they can now carry only 15 things each. Which are the 15 things a family will now choose to take?

Scene 3

As they are being transported, the vehicle breaks down, there is no option but to walk on. They cannot now carry 15 things and have to reduce their load. A family can manage only 10 things now. Which are the 10 things each family will now choose to take?

Scene 4

As they continue their hardships, they are now stopped at a checkpoint which permits a family to carry past the checkpoint only 5 most essential items due to the space constraint at the new place. Which are the 5 things each family will now choose to take?

Consumption and Needlessness



INTRODUCTION:

Standard of living and Quality of life are two important phrases when we talk about sustainable development. Standard of living is wealth and material comfort where as quality of life is the level of health, comfort, and happiness of an identifiable group of people. Buying stuff can make one happy for a short time but more often it leads to seeking more pleasure by buying even more. It is important that the individual consumption is rationalized and that would also help more equitable distribution of resources to meet basic need.

The needlessness or being able to identify consumption which is unnecessary is an important step to being a mindful consumer. Frugality is one word that is associated with sustainable consumption and is seen as a quality of being sparing, thrifty, prudent, economical or restraining in the consumption of consumable resources such as food, time or money, and avoiding waste, lavishness or extravagance. The lesson would help students reflect on their consumption habits and see the difference in consumption at individual level and country level.

Objectives:

Students will be able to

- explain consumption and the idea of needlessness.
- identify individual consumption habits.
- compare consumption across different countries.
- analyse what was useful and what was wasteful.

Eco-Schools Steps: Environmental review, Develop an Action Plan, Inform and Involve

Curriculum Linkage: Science/ Environmental Studies/Social Science



13-16
Years

Time required/ Duration:

- **Classroom session 1:** 45 minutes to set the context and brainstorm with students.
- **Home Assignment:** Six hours over eight days in total for students for the household consumption audit and reflection and action worksheet.
- **Classroom session 2:** 45 minutes to discuss the findings.
- **Classroom Session 3:** 45 minutes for classroom interaction for consolidating, analysing and discussing subsequent to the response received from the counterpart school.

Resources Required:

- Writing material
- Resource 2: Observation sheet for household consumption
- Resource 3: Reflection and Observation worksheet
- List from the counterpart school to share learnings
- Internet



Activity

Classroom session 1

- Give a background introduction and organise discussions to help students understand sustainable consumption.
- Brainstorm with students to prepare a list of different types of products we consume.
- Communicate with the Eco-Schools National Operator, for counterpart schools in another country for joining the discussion.

Home Assignment 1

- Teachers should provide students a week to achieve the following two tasks
 - household consumption audit. Students should make use of the personal household consumption checklist.
 - Complete the reflection and action worksheet. (Resource 2 and 3)

Classroom session 2

- Discuss in class the household consumption checklist and the reflection and action worksheet prepared by different students and
 - arrive at a consolidated list to avoid overlapping products.
 - choose most suitable actions.

Twinning Assignment:

Note you might have to approach the counterpart school through Eco-Schools National Operator for your country.

- Share your school's consumption checklist with a school situated in another country.
- Share with the counterpart school, the process you adopted to arrive at this list.
- Await for the response from the counterpart school.

Activity

Classroom session

- Facilitate students to analyse and compare your school's list with that obtained from the counterpart country.
- Discuss how choices of products, packaging, usage, etc contribute to the difference in the lists of the two schools.
- Put up both your school as well as the counterpart school lists on the Eco-Schools bulletin board.

Presentation and discussion on the comparative list obtained from another country. During this discussion get students to understand

- How many types of products are purchased in a week?
- Usage of a product and practices in place with respect to reuse, recycling and disposal.
- How choices of products, packaging, usage, etc impact the environment?

Evaluation:

Ask the students to give a list of products that they will buy less or look for alternatives.

Resources 2 & 3

Resource - 2

Household consumption checklist

Fill in the observation sheet to note your household consumption pattern (over a period of a week)

Date of Purchase	Types of products purchased					
	Food and Drinks	Toys	Books	Clothes	Stationery	Others
E.g. 1/2/2018	Cookies packet	Blocks (Plastic)		2 shirts for father	Ball-point pen	Mop
	Bottled water					

Resource - 3

Reflection and Action Worksheet

Think about the following:

Refer to Task 1, think about the different heads mentioned in the table below and fill in with appropriate actions that you can take

Product	Could I do without this? Yes/ No	Materials used in packaging it	How will the packaging be disposed?	How will the product be used? Will it be consumed or have to be disposed?	If disposed, how?	Is there a better alternative option? Mention it	Could we explore the alternative option in future?
Bottled water	Yes	PET Plastic bottle	Sent for Recycling or landfill	Consumed and disposed	-	Install a water purifier	Yes/ Maybe
Shirt	No	Cardboard box Plastic cover Metal pins	Cardboard box - recycled Plastic cover and metal pins - landfill	Worn and disposed Worn and recycled	landfill	donate it to someone less privileged	Not sure

Learning to be an Environmental Journalist

Before you Begin

Communication happens when there is an exchange of information between individuals through spoken words, gestures, or written form. It can be both verbal and non verbal. This is a natural part of the way we conduct ourselves. Communication as a discipline has evolved to include a deep understanding of using various media such as written media, audio-visual media and the emerging social media to share and exchange messages. Technical advancement including satellite technology for communication, mobile technology and revolutions in computer applications for social networking, messaging etc. have helped create a plethora of virtual media available to people.

When communication is produced and distributed with a purpose of sharing news about happenings in our social, political, economic environment in the immediate, national and international context, it is termed as Journalism. News too uses all forms of communication media from written to audio-visual. Journalists provide us with a daily update on what is happening in the world around us. Not only that, the way news are portrayed, stories formulated shape opinions of the recipients. With the advent of internet and ease of sharing the events, a new form journalism known as citizen journalism is emerging that involves the collection, dissemination, and analysis of news and information by the general public.

With the immense potential, come the challenges, and the plethora of media, information and news create an overload of messages that often can confuse or desensitize the recipient. For a communicator, it becomes a challenge to make oneself heard in this noise of messages. The challenge is to creatively engage the attention of the reader, listener, viewer and be able to communicate the key points across.

What are the different kinds of media being used/ can be used for communication as a journalist?

1. Print: written word works well with the literate community. Print media using visuals have been able to reach out to people with low literacy levels. Online published media is emerging as an important alternative to print media.
2. Audio-visual: Radio especially with the FM channels available, has huge potential and reach in the community especially in remote locations. Television programmes have a huge viewership and impact opinion in a big way.
3. Emerging social media such as the Facebook, WhatsApp, Twitter have found use in mass production and consumption of information.

All of these media can also support each other owing to technological advances. For example, e-newspapers, news blogs, facebook pages, FM radio etc. are available on smart phones and it is much easier to access information and share than it was before. So while there is huge potential for outreach, the danger is of ill-informed, poorly researched, biased or subjective stories to find a way into the media. Hence, responsible and sensitive reporting becomes imperative.

Journalism Basics

Frame the issue using the questions -
Who did **What** **Where** and **When**
Then look for additional information –
How did the what occur, or how did the who do the what?
Why did the who do the what?

One of the emerging challenge of media is to be able to spot the bias and power to manipulate. Literacy for many years was associated with one's ability to read and write. The scenario has changed over time when it was primarily a print media from which one got information to a situation where we get our information from a complex interwoven system now heavily dependent on technologies. Hence, the ability to read many types of media has become an essential skill in the 21st Century. Media literacy has been defined as the ability to access, analyze, evaluate, and create media. As an outcome, media literacy helps to better understand the complex messages we receive from television, radio, Internet, newspapers, magazines, books, billboards, video games, music, social media and other forms of media. Media literacy is an effective and engaging way to apply critical thinking skills to a wide range of issues.

Media literacy skills developed through journalism can also help young people develop critical thinking skills by being able to:

- recognize what the message creator wants us to believe or do
- understand how media messages influence, shape and sustain a culture and society
- recognize bias, spin, misinformation/ lies
- decipher the information not being presented
- identify the intended target group of the media
- evaluate media messages based on own experiences, skills, beliefs, and values
- create and distribute own messages across different media

A good journalist needs to have media literacy skills. This strand looks at three key media used as a part of the YRE programme – newspaper article writing, using photographs to tell a story, and using videos for communicating about an issue.

Managing Waste ... through a Handprint - Actions towards sustainability approach



Introduction

The Footprint and the Handprint are two complementary concepts that help people like you and me to find their own best way to lead a more sustainable lifestyle that would contribute towards a sustainable society and planet. The Ecological Footprint is a measure of human pressure on earth's resources. Every human being has an ecological footprint. It is the lifestyle that determines how small or big an individual's footprint is.

Handprint is a measure of what we can do individually, and together, to restore the balance between consumption and the planet's carrying capacity.

Positive stories have powerful impact in having ideas that can motivate others to take actions and it is important in context of environment when we want people to have hope and work towards a solution.

Objectives:

Students will be able to

- investigate different print media for coverage pertaining to waste.
- analyse news coverage.
- investigate positive news.
- plan and implement handprint actions.

Eco-Schools Steps: Environmental review, Action Plan, Inform and Involve, Eco-code
Curriculum Linkage: Science/ Environmental Studies/Social Science/ Global Citizenship



Time required/ Duration:

- **Classroom session 1-** 60 minutes for introduction and background, and group work.
- **Home Assignment:** 15 days for media analysis.
- **Classroom session 2:** For planning and sustaining year-long handprint actions.

13-16
Years

Resources Required:

- "City's zero-waste woman" - newspaper coverage
<https://mumbaimirror.indiatimes.com/mumbai/other/citys-zero-waste-woman/articleshow/61212063.cms>
- Writing material
- Internet and other print media
- Resource 5 (Hand Print)



Activity

Classroom session **1**

- Discuss with students the need to look at both types of coverage - those which reflect the negative impacts of waste and those which reflect positive actions to deal with the waste problem.
- Ask the students the advantage of positive stories.
- Explain to students that this positive action to solve environmental problems is called the “handprint” action.
- Assign student groups (3-4 members in each group) and get them to investigate handprint actions relevant to waste. Resource 4 “City's zero-waste woman” has been provided as an exemplar.
- Subsequent to going through Resource 4, ask each group to make a presentation of their views.

Home Assignment **1**

- Provide student groups 15 days time to go through the different types of news items covered in different print media. Student may look at the online editions of Newspapers, TV channels, Social media pages that are dedicated to positive stories - For example the Better India.
- Guide students to collect relevant articles and bring the same back to class.

Classroom session **2**

- Get student groups to consolidate the different news items/stories that they have collected. Ask one student from each group to make a presentations of the different handprint actions that their group researched.
- Select representative news items that could be put on display on the Eco-Schools bulletin board as part of inform and involve.
- Ask the students to plan and implement a handprint action related to waste management that they can implement in their class/ school.
- Get students to frame an Eco-code which addresses waste management through a handprint action approach.
- The Eco-code developed by the students should be displayed on the Eco-Schools bulletin board/ other appropriate locations.

Continuous engagement:

- Teachers should ensure that students sustain their handprint actions year long.

Evaluation:

Get students to evaluate the success of their waste handprint action. Some questions you can ask how can we prioritise our Hand Print actions, the challenges we might face and what could be our strategy to overcome those challenges.

Resource 5

Handprint

- The Handprint was launched by Centre for Environment Education (CEE) in 2007 at UNESCO's 4th International Conference on Environmental Education at Ahmedabad, India.
- The concept emerged from one of the CEE's Programmes - Environmental Education in Schools of Andhra Pradesh (EESAP 2000 to 2008). The programme, implemented in 1500 schools, engaged students in small action projects in and around schools, and involving communities.
- Decade of Education for Sustainable Development (DESD), 2005-2014 also recognized Handprint as a measure of ESD action; action that is directed to decrease the human footprint and make the world more sustainable. Handprint represents the belief that we can make a difference through individual and collective actions to solve the environmental problems.

Read more about the Handprint <http://www.handprint.in/>



Using Video to communicate about an issue



Introduction

One of the most powerful mediums of communication, videos are used often by a variety of professions. The videos can range from project documentations to advertisements, interviews, documentaries and short films. Phones and cameras can capture small video clips of an issue and these can easily be made into a film. Like in the case of taking photographs, a video would require preparation. A storyline with a clarity on the message that the video would convey is critical to developing a good video. It is also important to define the approach, the length and format of the video. The message mostly defines the treatment of the video to be developed. It would also be important to decide the sound, voice over and other aspects once the story is decided.

Objectives:

Students will be able to

- identify an issue that can be presented through a video.
- develop story line, plan the approach and format of the video.
- facilitate the editing/ do it themselves (in case they have the skill).
- present their story through the video.

Eco-Schools Steps: Action Plan, Inform and Involve, Eco-code

Curriculum Linkage: Science/ Environmental Studies/Social Science/ Global Citizenship

Time required/ Duration:

- **Classroom session 1:** 45 minutes for introduction of the topic and classroom activity through sharing different types of videos and classroom discussion. Use YRE Handbook Video case study 1 and 2, to share as case examples (<https://static1.squarespace.com/static/552e4b07e4b0d43bb9fe3f42/t/56c5ea42d210b8884d3f0c3d/1455811156660/YRE+handbook+--+part+2-2.pdf>).
- **Home assignment:** Ten to fifteen hours over a month to identify an issue, develop a story line, script, shoot a video.
- **Classroom session 2:** 45 minutes mid way resolving queries of the students.
- **Classroom session 3:** 45 minutes - Presentation of the videos by students, review and discussion on the stories. Putting up the videos online on Youtube.

Resources Required:

- Video samples for presentation
- Projector
- Cameras/ phone cameras
- Internet
- Writing material
- Resource 6 (What makes a good video?)



Activity

Classroom session 1

- Show a set of videos in the class. Use YRE Handbook Video Case Study 1 and 2 (<https://static1.squarespace.com/static/552e4b07e4bod43bb9fe3f42/t/56c5ea42d210b8884d3f0c3d/1455811156660/YRE+handbook+--+part+2-2.pdf>).
- Get students to discuss these videos from the perspective of the key fundamentals of video production discussed earlier. They have to visualize themselves as video journalists and comment on the videos.
- Ask the students to divide themselves into teams for the exercise on making their own videos.
- Ask the students to identify a topic on which they propose to do videos. Some of the issues which students may choose include
 - Waste disposal practices'
 - Waste segregation and collection
 - Littering behavior (in public places such as parks, streets etc.)
 - Collection of waste, cleaning etc.
- The students could work in teams or individually.

Home Assignment 1

- Guide the students to identify and observe one issue related to waste management near their homes.
- Tell them that they must look for interesting story possibilities.
- They could also interview people for the video.
- Once their storyline and approach and treatment plan are ready, ask them to meet you.

Classroom session 2

- Get the students to share their storylines, approach and treatment plans with you. It may not be a classroom presentation but they could share them individually with you. Give feedback and help solve queries if any.

Classroom session 3

- Have the students make presentations of their films and discuss them in the class, get peer feedback.
- Ask the students to vote for the best videos.
- Discuss the aspects that have led a video to be the best video.

Evaluation:

- Identify if the main theme is getting reflected and amplified through the video.
- Check for the following in the student videos
 - Visual appeal
 - Factual correctness
 - Flow of the story/ information
 - Clarity and ease of understanding

Resource 6

What makes a good video – Fundamental pointers:

1. Think about your story – You could ask yourself the following –
 - a. What's the problem?
 - b. What's the solution?
 - c. Visualizing the shots you will need: You will need footage for every single second of the story you want to tell.
 - d. Who you can talk to? – Most good stories are about interesting and engaging people
 - e. Remember the basic rules of journalism!
2. Write a script – this is the basis for planning the film and helps to organize your thoughts and decide how to tell your story.
3. Plan your production: Create a storyboard and list shots and the plan for taking these shots including the equipment you would require etc. In the plan, include production times, storyboard or visual concept, interviewee list, references, resources, shot list.

See Storyboarding Tips in the YRE Handbook

(<https://static1.squarespace.com/static/552e4b07e4bod43bb9fe3f42/t/56c5ea42d210b8884d3foc3d/1455811156660/YRE+handbook+++part+2-2.pdf>)

4. Have your team in place: You may need a team to handle the camera, lights, sound, for doing a good interview or to watch out for traffic, if you are shooting outdoors. Enlist your friends to help and assign them clear, well-defined roles.
5. Decide your equipment:
 - a. Carefully choose your equipment based on the number of people in your team, what is possible to carry with ease, where will you be filming (indoors or outdoors), what is the space available and time on hand to set up your equipment to shoot. You can use a SLR, DSLR or even your smartphone cameras or try the GoPro camera.
 - b. Plan the lighting conditions and see that there is continuity.
 - c. Check the camera's internal microphone, else use a lapel mic for the interviews to cut other sound. If not available, use the Voice Memo function on your smartphone.
 - d. Use a tripod to ensure that your videos are not shaky.
6. Good to begin with your interviews:
 - a. It will be helpful to talk to the interviewees before you actually get down to doing it on film. Discuss with them your questions and keep it relaxed. Ask questions to get them to articulate their feelings as facts can be researched. The human interest angle in a story will make it easier for viewers to relate to.
 - b. The interviewees should never look straight into the camera. Stand just beside the lens, and ask your guest to look at you.
 - c. Use different angles for some variety.
 - d. Do it in a quiet place.
 - e. Try to capture your guest doing something – say walking, looking out of the window.
7. Get your pictures: Take the shots you need to tell your story. You need to ensure that you get at least 5-10 seconds per shot.

8. Write your final script: Assess what you have shot and revisit the script. Finalise it to include the narration and interviews in a continuous flow. Keep it short, to the point, use short sentences and action verbs.
9. Editing: Use the script to pull all the visuals together.
10. Music: In case you feel that a music piece would enhance the story or set a mood to the video, you could choose an appropriate one and add it. Don't overdo it. Check out free music on the internet and sound FX (Foley) on YouTube Audio Library. When adjusting sound levels, bring music levels down when people are speaking. Be cautious of legal matters as available on <http://www.yre.global>.

The activity is suggested to enable students to create videos as citizen journalists.

References

Young Reporters for the Environment, Handbook for Students and Educators. Available on <http://www.yre.global/handbook/>

<http://www.bbc.co.uk/academy/journalism>

Introduction to Media Literacy, Montana office of public instruction.

<https://www.youthconnectionscoalition.org/content/wp-content/uploads/2014/07/Intro-to-Media-Literacy.pdf>

<http://www.bbc.co.uk/schools/gcsebitesize/english/creativewriting/commissionsrev2.shtml>

<http://www.yre.global>

Link to download the winning photographs

<http://www.yre.global/our-winners-photo/>

Link to access the Judging Criteria

<http://www.yre.global/judging-criteria/>

Link to download the winning videos of YRE

<http://www.yre.global/videos/>

Legal Matter has a lot of significance in the field of media today. It is your responsibility to be aware about the rules and regulations related to media creation when you work on your piece. Any submissions that FEE finds legal doubt about will be ineligible to win the international competition. If you have any doubts on this matter, please contact the national operator in your country or the YRE International Head Office.

Use of music for video entries: It is illegal to copy or otherwise infringe upon the rights of copyright-protected music, without the express written permission of the copyright/rights holder. Obtaining music licences to permit the use of copyright-protected material, even for a not-for-profit video, can be problematic. As such, it is strongly recommended that you do not use copyright-protected music in your video.

Please note that many platforms currently scan uploaded videos for coincidences with copyright-protected work. Work found to be using copyright-protected material is usually detected by copyright bots, and suspended from the platform. In some countries, infringement of copyright law is enforced, and punishable by hefty fines and a criminal record. Please be aware of your national copyright laws.

As an alternative, you can resort to the YouTube Audio Library, which offers royalty-free tracks made available for any not-for-profit creative purpose, and do not require written permission from the copyrights holder.

Music may also be published under an open content licensing scheme, such as the Creative Commons licence. There are still terms, conditions and restrictions applicable for music taken from the above sources, so please ensure these are fully observed and there is no copyright infringement in your video entry.

Hazardous Waste

Before you Begin

Waste is considered to be hazardous if it exhibits one of the following properties - ignitability, corrosivity, toxicity or reactivity. The properties of these wastes make them potentially hazardous for humans and the environment. These wastes can either be by-products of manufacturing processes (as in devices like CFLs) or simply discarded commercial products, like cleaning fluids or pesticides.

These wastes can be found in different physical states - gaseous, liquids, or solids. It is important to be careful with hazardous waste as it is a special type of waste and should not be disposed off the ways we dispose by-products of our everyday life.

Do our households have hazardous wastes? Do we realise that the day-to-day chemicals we use at households are potentially hazardous in nature? Some of the chemicals used at homes are hazardous in nature, it is important to identify these and identify potential alternatives where possible.

What classifies as potential household hazardous wastes? There are many. The resources provided with the lesson plans will help identify some of these. It is important to first recognise a product as a potential hazardous waste. The resources provided in this lesson plan also help one understand the meaning and interpretation of these symbols. To start with it is important to know that hazard symbols on products have three parts (refer to reference chart under resources for more information):

1. the picture
2. the frame
3. the caution (signal) words underneath the image



POISON

Dangers of household hazardous products

- Mixtures of some hazardous products can produce dangerous vapours, explosions or fires.
- Products containing acids can burn the skin, eyes or respiratory tract.
- Exposures to solvents and pesticides can cause nausea, headaches, convulsions, etc.
- Repeated exposures to chemicals can cause cancers.
- May cause incidences of poisoning in infants or pets.
- Environmental damage by pesticides - along with killing some pests, they also cause a lot of harm to other beneficial insects including butterflies.

It is thus imperative to reduce hazardous waste products at home

- Be a smart shopper and buy only what you require.
- Look at the product labels carefully and find out if there are less toxic alternatives.
- Follow all the safety instructions while handling the product, while storing the same and also responsibly dispose it.
- Use alternative non-toxic home based products where possible.

Household Hazard

Lesson 1 Plan

INTRODUCTION

The lesson plans encourage students to investigate household hazardous wastes. At our household, a variety of chemicals are used which is hazardous in nature if not handled properly during its use and disposal. The risk of environmental pollution and negative health impacts from these types of material is very high. Improper disposal like burning of waste in household fires or stoves exposes individuals especially young children to dioxin emissions.

The lesson plan helps children in indentifying such hazards.

Eco-Schools Steps: Environmental review, Curriculum linkages, Inform and Involve

Curriculum Linkage: Science/ Environmental Studies/Social Science

Objective:

Students will be able to

- identify the products used in homes can be hazardous in nature.
- list and classify household hazardous wastes.

Time required/ Duration:

- **Classroom Session 1:** 90 minutes

Resources Required:

- Hazardous waste products and labels.
- Resource 1 Hazardous waste symbols reference chart - to understand and interpret reading of labels.
- Resource 2 (Hazardous waste table).
- Some real products with the hazardous labels for use by the teacher as part of demonstration as well as evaluation.
- Magnifying glass - might be handy to read labels with very small text.



9-12
Years



Activity

Classroom session **1**

- Start with a discussion introducing students to the different types of products consumed at home for various requirements including cleaning, personal care, pest control to name a few and mention that a range of products with different constituents are available in the market for these functions.
- Demonstrate to students the different products packaging/labels.
- Ask students to read the labels of some of the hazardous products.
- Lead the discussion to help students identify the potential hazards and appropriate care needs to be taken while handling and disposing them.
- Divide students into groups, give them the different labels to discuss.
- Facilitate student discussions to identify and recalls text and visuals that indicate hazardous nature like words (danger/ poisonous/ etc); symbols (corrosive, flammable) on the labels of the different products.
- Ask students to read the warning instructions on these labels and classify their findings in the Hazardous waste table.
- Ask each group to make a presentation of their findings to the class.

Evaluation:

Ask students to share their thoughts on how the use of hazardous material can be reduced.

Resource 1

Hazardous waste symbols reference chart - Understanding hazard symbols

Hazard symbols are on the labels of many products in and around your home and garage, like cooking spray, cleaning products, paint thinners, drain cleaners and windshield washer fluid.

Hazard symbols have three parts:

1. the picture
2. the frame
3. the caution (signal) words underneath the image

1. Hazard symbol pictures

The picture tells you the type of danger:



EXPLOSIVE

The container can explode if heated or punctured. Flying pieces of metal or plastic from the container can cause serious injury, especially to your eyes.



CORROSIVE

The product can burn your skin or eyes. If swallowed/ingested, it can damage your throat and stomach.



FLAMMABLE

The product or its fumes will catch fire easily if it is near heat, flames, or sparks. Rags used with this product may begin to burn on their own.



POISON

If you swallow, lick, or in some cases, breathe in or touch the chemical, you could become very sick or die.

2. Hazard symbol frames

The shape of the frame around the hazard symbol tells you what part of the product is dangerous:



If it's a triangle, it means the container is dangerous.



If it's an octagon, it means the contents are dangerous.

3. Signal words

The signal word(s) underneath the hazard symbol explain the degree of risk:

Symbol -



Signal word - DANGER EXPLOSIVE

Signal words:

- CAUTION means temporary injury may result. Death may occur with extreme exposure.
- DANGER means may cause temporary or permanent injury, or death.
- EXTREME DANGER means exposure to very low amounts may cause death or serious injury.

(Source: <https://www.canada.ca/en/health-canada/services/home-safety/household-chemical-safety.html>)

School Hazardous Waste Survey



INTRODUCTION

School as an institution can be a laboratory to explore the issue of hazardous waste for the students in an institutional settings. The lesson plan builds upon the learning students had while exploring the hazardous waste in the homes. The lesson plan encourages development of a policy for their school.

Objectives:

Students will be able to

- identify different products are used at household level which are hazardous in nature.
- undertake a school audit/ survey to understand the generation of hazardous wastes in their respective schools.

Eco-Schools Steps: Environmental Review, Curriculum linkages, Inform and Involve, Eco-code

Curriculum Linkage: Science/ Environmental Studies/Social Science/School Safety

Time required/ Duration:

- **Group Assignment:** 45 minutes for the group activity with students for identifying and classifying household hazardous wastes used in different areas within the school.
- **Classroom Session 1:** 45 minutes for group presentations, wrap up session, to develop an Eco-Code and display on the Eco-Schools bulletin board.



13-16
Years

Resources Required:

- Resource 1 (Hazardous waste symbols reference chart - to understand and interpret reading of labels).
- Hazardous products and labels.
- Resource 2 (Hazardous waste table).
- Resource 3 (School Hazardous waste - survey chart).
- Some real products with the hazardous labels for use by the teacher as part of demonstration as well as conclusion.
- Magnifying glass - might be handy to read labels with very small text.
- Writing materials.



Activity

Group Assignment **1**

- Engage students to understand that many chemicals used in the school campus are hazardous in nature.
- Divide students into teams, each group in the school should be assigned to different areas within the school. These teams should look at the following:
 - school gardens
 - school sanitation and hygiene (toilets, water purification and pools)
 - school cafeteria (washing of utensils, storage of food, pest control within the cafeteria)
 - others
- Lead student observations such that students look at appropriate words (danger/ poisonous/ etc); symbols (corrosive, flammable) on the labels of the different products that are used in different areas/ facilities within the school.
- Ask students need to read the warning instructions on these labels and should classify their finding in the Resource 4 (Hazardous waste table).

Classroom session **1**

- Ask each group to make a presentation of their findings to the class.
- Ask student to compile their survey data for display on the Eco-Schools bulletin board.
- Eco-Schools team should aim at developing an Eco-code for at least one area in the school and look towards reducing the use of these hazardous chemicals.

Evaluation:

Ask students to propose a list of products that should be banned from school campus.

Sustainability and Waste

Before you Begin

Over the past three hundred years, technology has unquestionably enhanced the life and wellbeing of a greater portion of humanity than in all of the human history that went before. Ordinary people can now live longer, healthier and more fulfilling lives than even the mightiest people of earlier times.

One with the greatest promise, comparable to that of the coal and oil which fueled the industrial revolution, and the Green Revolution which saved so many from starvation, is the wide spectrum of materials called Plastics. Life today, whether in the richest or poorest communities, is unthinkable without these materials. They pervade every activity, every nook and corner, of human existence. From materials to build houses, through buckets to carry and store water, to automobiles and appliances for mobility and productivity, finally to packaging for preserving food – human survival is hard to imagine today without the use of plastics.

Unfortunately, the very properties that make them valuable – versatility, durability, multiple uses, resistance to degradation – have, within a century after their introduction into the market, made them into a life-threatening menace.

Plastics now also pervade every habitat and every nook and corner of the planet's environment. In the home, tiny particles of plastic ("micro-plastics") pervade the indoor air and settle on food and eating utensils, creating health hazards that are only now beginning to be recognized, but already thought to be quite dangerous.

In the streets and landfills of cities and villages, remnants of plastic bags get eaten by animals, only to strangle their internal organs. In the oceans, from the surface to the bottom of the deepest trenches, pieces of plastic testify to the presence, possibly far away, of human "civilization". The Pacific Gyre, a (continent-sized) island made entirely of waste plastics 1.6 million sq. km – three times the size of France – floats aimlessly feeding sea-birds, fish and whales with an indigestible diet of non-degradable plastic. No sea life can survive such poisoning.

The solution is not to ban all plastics all of a sudden. That was necessary and possible in the case of DDT, CFCs and leaded petrol. What is now needed is an immediate stoppage of plastics use that is either not essential or is substitutable by other more environmentally benign materials. And, of course, urgent support must be given to research and innovation to develop alternatives that bring the same benefits but do no harm.



Life Cycle Analysis



INTRODUCTION

Life Cycle Analysis (LCA) is defined as a technique to assess the environmental impacts associated with all the stages of a product's life from raw material extraction (mining or logging) through materials processing, manufacture, distribution, use, repair and maintenance, and disposal or recycling. The process, the materials, the product and its recycling all create an impact on the environment.

There are several types of for different products and a could be done for products which provides and insight into:-

- Cradle-to-Grave: The full life cycle of a product from raw materials (cradle) to the disposal phase (grave).
- Cradle-to-Gate: A partial product life cycle assessment that investigates a product from raw materials (cradle) to the gate of the manufacturing facility before transportation to the consumer.
- Cradle-to-Cradle: A product life cycle assessment, where the end phase includes recycling of the product into a new product. The recycled product can be identical or different to the original product.

The lesson plan encourages students to do a system thinking analysis.

Objectives:

Students will be able to

- explain how demand affect the development of products, services and processes.
- analyze the environmental implications of the products on environment, health and safety.
- assess life cycle and list the inputs and outputs of packet of chips.
- make an inventory of the different materials which go into the making of a product.

Eco-Schools Steps: Environmental Review, Curriculum linkages, Inform and Involve
Curriculum linkage: Environmental science, Social science

Time required/ Duration:

- **Classroom Session:** 45 minutes for doing a desk research of the product

Resources Required:

- Writing material
- Computer with speaker and screening facility.
- Packet of potato chips in aluminum foil packet.
- Photos bauxite, alumina, aluminum and packaging, potatoes, salt, oil.



Activity

Classroom session **1**

- Start the discussion about the life cycle of a plant. You can ask them questions about the input and output of the plant as it grows from a seed and also what happens when the plant dies?
- Screen the movie 'Lifecycle of a t-shirt' using this link.
https://www.youtube.com/watch?v=BiSYoeqb_VY
- Divide groups into teams of 7-8 students. Give them commonly used products such a packet of potato chips.
- Ask them to discuss and draw a flowchart of the life cycle of a packet of potato chips.
- Facilitate the thinking of the children so that they will be able to come up with all contents like potatoes, oil, salt; as well as the packaging contents such as aluminium (made from mined bauxite and coal), plastic, inks and dyes.
- As the students to answer the following questions and document it in a worksheet.
 - a) What is the product made from?
 - b) Where did the components come from?
 - c) Who made it?
 - d) Where was it made?
 - e) How is it packaged?
 - f) How is it transported to market?
 - g) What are all the inputs and the outputs of the product?
 - h) What will happen to the product at the end of its life?
- Ask students to investigate an alternative way to meet the same need or want using fewer resources.
- It is also important to make students understand that in the process of manufacture of products
 - Resources are utilised (which are depleting and because we are not recycling, it is further adding to depletion).
 - Different forms of energy used (some renewable and others non-renewable).
 - Waste in the form of emissions is produced - affecting soil, water and air.
 - Waste is generate in terms of the items disposed and now a crisis of how and where to dispose these products.
- Ask the students to work on one of their favorite products and conduct the LCA at home.

Evaluation:

Check for the depth of life cycle analysis to identify the resources used in every step of the processes and suggest ways to reduce the wastage.

Resource 1

Food Packaging and More...

Story of the Mumbai dabbawala's:

“The 5,000 or so dabbawalas (Tiffin/Lunch Boxes Carriers) in the city have an astounding service record. Every working day they transport more than 130,000 *daabas* or lunch boxes throughout Mumbai, the world's fourth-most-populous city. That entails conducting upwards of 260,000 transactions in six hours each day, six days a week, 52 weeks a year (minus holidays)”

“On any given day, a dabba changes hands several times. In the morning a worker picks it up from the customer's home and takes it (along with other dabbas) to the nearest train station, where it is sorted and put onto a wooden crate according to its destination. It is then taken by train to the station closest to its destination. There it is sorted again and assigned to another worker, who delivers it to the right office before lunchtime. In the afternoon the process runs in reverse, and the dabba is returned to the customer's home” . Excerpts from a study by Stefan Thomke, professor from the Harvard Business school, Source: <https://hbr.org/2012/11/mumbais-models-of-service-excellence>).

Professor Thomke's study was to analyse the amazing delivery system of the Mumbai dabbawala's which has been almost flawlessly executed for over a century now (since 1890). Beyond the excellent delivery system in place is the fact that these dabbawala's have been using reusable tiffin boxes for the delivery of lunch. Just imagine the volume of waste which will be generated each day, if instead of the reusable lunch boxes, food was transported around in disposable packaging material?!

Innovations and Technologies to deal with Packaging Food Waste

Plate bank:

Functions, parties and get togethers at home have increasingly become a large source of waste generated, especially disposable plastic cutlery. Some individuals and organisations have now come up with innovative techniques as well as technologies to deal with this problem. The eco-friendly plate bank, initiated and maintained by Adanya Chetana, is one of the largest of its types in the city of Bangalore, India. The plate bank has close to 10,000 sets of steel plates, spoons, glasses, cups, etc and can be borrowed by individuals, organizations and educational institutions for events at zero cost. The article by a leading newspaper, Hindu <http://www.thehindu.com/news/cities/bangalore/plate-banks-try-to-reduce-disposables-by-lending-utensils/article22454225.ece> covered other such initiatives in the city of Bangalore. The idea behind the plate bank in most of these cases is to bring down the volume of waste generated during such events and celebrations.

Edible solutions to packaging waste?

Edible spoons and forks manufactured from products including millets (jowar), rice, wheat and different types of spices for the flavouring <http://www.bakeys.com/india-innovates-episode-4-edible-cutlery/>; edible sachets (for beverages, instant mix for noodles) made from sea weed (Source: <http://www.evoware.id/>); bacteria to produce cellulose which is in turn used to manufacture edible food wrapper (<https://www.natureasia.com/en/nindia/article/10.1038/nindia.2012.11>) are some of the solutions different innovators are finding to problems associated with packaging of food items. These are smaller steps in the direction of reducing packaging waste... what needs to be seen is how soon we are able to contain the problem in the times to come.

Traditional waste-free solutions:

Traditionally in leaves from different plants, especially Sal (*Shorea robusta*) and banana (*Musa* species) have been in use in India and many other cultures in Asia plates and bowls for serving food, especially during functions and festivals. It is such a fantastic way to eat food on these leaves as both the leftover food on the leaf and the leaf itself are not just biodegradable but also consumed by cattle, completely doing away with the problem of disposal of waste also.

Technology interventions:

MIWA (<http://www.miwa.eu/about-us>), based in the Czech Republic has initiated various technological interventions to take care of the generation of packaging waste in the first place, by encouraging “pre-cycling”, they have approached the packaging problem in a different perspective.

Study the article “These 11 innovations will tackle the causes of ocean plastic pollution, not just the symptoms” (<https://www.weforum.org/agenda/2018/01/these-11-innovations-will-tackle-the-causes-of-ocean-plastic-pollution-not-just-the-symptoms>)

Plastic a boon or bane?!



INTRODUCTION:

Plastics have become omnipresent and essential part of our life due to its properties like being light weight requires less energy to transport, cheaper than alternatives and conserve metal and wood resources, very durable and inert nature finds usage in many industries and storage but the same properties make it undesirable as they remain forever and choke up natural systems especially water ways and are killing wild animals both on land and in ocean.

The problem associated with plastics is more to do with our behaviours of littering. The lesson encourages children to research the issues with plastic and develop an Eco Code.

Objective:

Students will be able to

- observe the omnipresence of plastic.
- explain the negative impact of plastic on the environment.
- develop an attitude of thoughtful buying leading to waste reduction.
- reflect on whether plastic is really needed and what are the alternatives to plastic use.

Eco-Schools Steps: Environmental review, Curriculum linkages, Inform and Involve, Eco-Code

Curriculum Linkage: Science/ Environmental



13-16
Years

Time required/ Duration:

- **Classroom session 1:** 45 minutes (for screening two documentaries, 'Plastic Ocean' and 'You Can Live Without Producing Trash').
- **Home Assignment:** Two days for auditing personal plastic use.
- **Classroom Session 2:** 45 minutes for wrap and for preparing the Eco-Schools bulletin board for display.

Resources Required:

- Student stationery including notepads and writing material.
- Internet
- Laptop/ Projector
- Video links - Film "Plastic Ocean" and "You can Live Without Producing Trash"



Activity

Classroom session 1

- Screen the two documentaries. Make it sure that the documentary on Plastic ocean is screened first.
- Facilitate a classroom based interaction with students discussing various uses of plastic in their daily lives, including their advantages and disadvantages.

Home Assignment 1

- Ask the students to document the different types of plastic they use over two days with details of the purpose of use, including advantages, disadvantages and alternatives.

Classroom session 2

- Divide the class into individual groups.
- Ask the members of the group to share their consolidated lists.
- Engage students in a discussion on different ways plastic products which could be avoided.
- Ask the students to display the list on the Eco-Schools bulletin board as part of inform and involve.
- Ask students to develop an Eco-Code to reduce the generation of plastic waste.
- Ask the students to share the Eco-Code on the Eco-Schools bulletin board and run a signature campaign.

Evaluation

- Teachers should be able to assess student understand based on the following
 - Lists prepared by student groups as part of the home assignment.
 - Eco-Code developed by students.

Resource 2

Video Links:

1. **Plastic Ocean'**
https://www.youtube.com/watch?v=ju_2NuK5O-E (impacts of plastic on seabirds)
2. **You Can Live Without Producing Trash'** (how to reduce the waste individuals produce)
<https://www.youtube.com/watch?v=nYDQcBQUdPw>

A Miracle Product

1885
 EASTMAN American Film was patented to be further produced by George Eastman Kodak

1941
 Henry Ford's 'Soybean Car', that used soybean fibre in a phenolic resin with formaldehyde for the plastic panels, was unveiled.

1988
 Recycling symbols for plastics introduced

1925
 Leo Bakeland introduces the word 'Plastic'.

1950
 Polyethylene bags with handles make their first appearance.

1958
 Lego patented its stud and block coupling system and went on to produce toys.

1965
 'Kevlar' is first developed by DuPont and used in tyres.

1940
 With the introduction of PVC, radar cable insulations started using Polyethylene.

1969
 The first man on moon, Neil Armstrong, plants a nylon flag of the United States to mark his landing.

1973
 Motorola's Martin Cooper designs DynaTAC, the first ever handheld and portable phone.

1977
 PET (Polyethylene terephthalate) bottles introduced

1997
 Captain Charles Moore discovered the 'Great North Pacific Garbage' patch formed due to ocean currents

2010
 An e-reader, Amazon Kindle, designed using a resilient plastic outer body case

2000
 Nanotechnology starts being applied to polymer and composite applications.

But...

India generates 5.6 million tonnes of plastic waste annually

8 millions tonnes of plastic is estimated to enter ocean

Ten of the world's rivers carry 90% of plastic to the world's oceans.

Greenpeace, an environmental NGO, stated that at least 267 different animal species are known to have suffered from entanglement and ingestion of plastic debris

CEE
 Centre for Environment Education

Take It Back!



INTRODUCTION:

Extended Producer Responsibility (EPR) is a strategy designed to promote the integration of environmental costs associated with goods throughout their life cycles into the market price of the products. Extended producer responsibility focuses on the end-of-use treatment of consumer products and has the primary aim to increase the amount and degree of product recovery and to minimize the environmental impact of waste materials. The EPR has its roots in concerns about scarce landfill space and potentially hazardous substances in component parts.

EPR encourages take-back with an aim to:-

1. encourage producer to design products for reuse, recyclability, and materials reduction.
2. incorporate waste management costs into the product's price.
3. promote innovation in recycling technology.

Objective:

Students will be able to

- define the concept of extended producer responsibility.
- Identify corporate/products that encourage Take – It – Back.
- resolve to support EPR products.

Eco-Schools Steps: Environmental review, Curriculum linkages, Inform and Involve

Curriculum Linkage: Science/ Environmental Studies/Social Science



13-16
Years

Time required/ Duration:

- **Home Assignment:** Research for the advantages and disadvantages of EPR from different stakeholders' perspective.
- **Classroom session 1:** 45 minutes for the EPR discussion.

Resources Required:

- Student stationery including notepads and writing material
- Internet

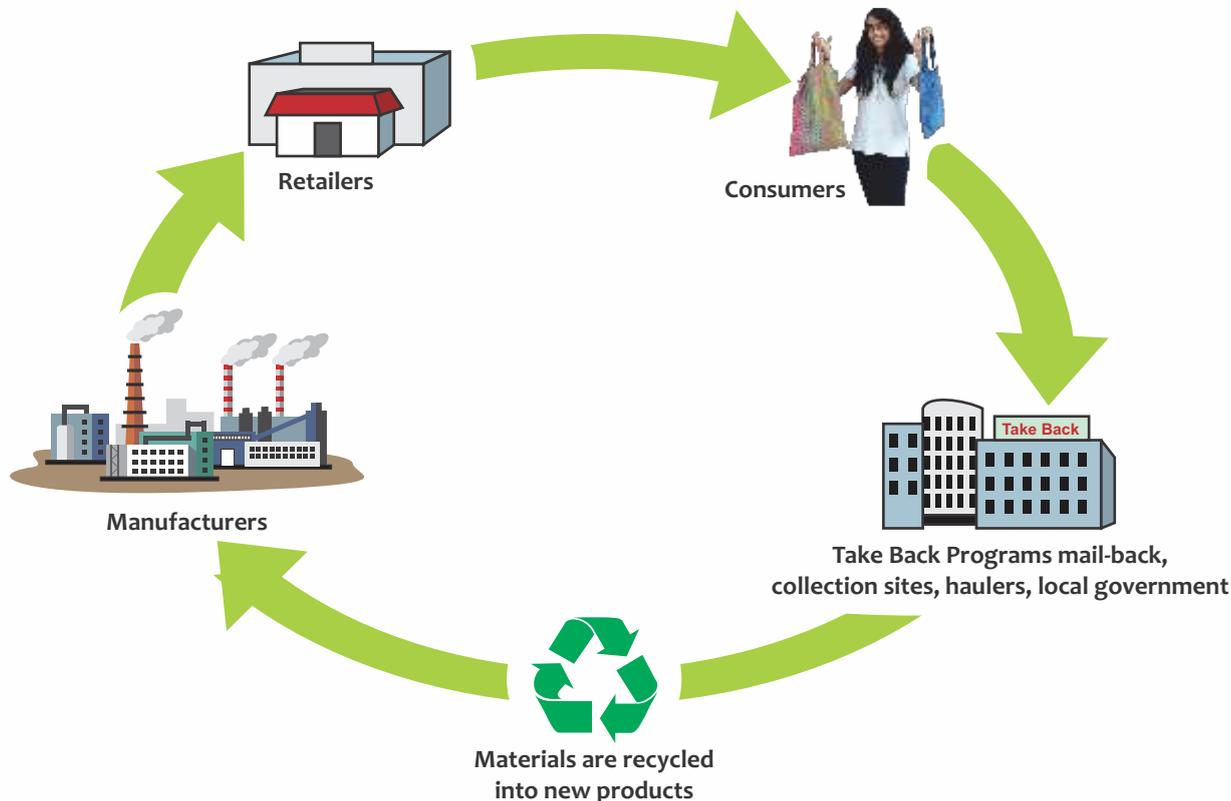


Activity

Divide the class into two groups. Ask them to research and prepare for a debate for and against EPR being made mandatory. Encourage them to look for case studies to substantiate their arguments.

Classroom session 1

- Ask the groups to suggest a panel of 3 persons who would represent them in panel discussions on 'for and against' motion of EPR being made mandatory.
- Ask students by raise of hands and count how many of them agree or disagree to the proposal. Take the count.
- Ask the panels to present their arguments for and against the motion. Teacher should act as moderator for the panel discussion.
- After the discussion, again take the vote of students in the audience.
- Ask the children to list the advantage and disadvantage of EPR.
- Ask the students to prepare a list of five products that should have mandatory EPR with the reasons.



Evaluation

The list of products would give an idea to what extent students have understood the concept of EPR.

References

- <https://www.youtube.com/watch?v=HH8Q6jAlmv0>
<https://www.youtube.com/watch?v=JqnvJQwA1KY>
<https://balloonsblow.org/>
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Marine Waste

Before you Begin

Marine debris or marine litter, is human-created waste that has deliberately or accidentally been released in a lake, sea, ocean or waterway. Marine debris is anything that does not belong in the ocean, that could range from abandoned ships to tiny plastic fibers from clothes. Floating oceanic debris tends to accumulate at the center of gyres (a large system of circulating ocean currents) and on coastlines. Waste is today also being deliberately dumped into the oceans and this deliberate disposal of wastes at sea is called ocean dumping.

Plastics are a major source of global marine pollution. Once plastic particles reach the marine environment, wind and global ocean currents can spread them around the world. As a result, plastics are dispersed across all oceans, and can be found in remote locations such as the Arctic, Southern and deep oceans. Ocean plastic pollution is an alarming issue due to its persistence, complexity, steady growth and the pervasive impacts it has on all aspects of ecosystems. The problem requires holistic environmental remediation solutions at a global scale.

Ocean plastic pollution has received increased attention in recent years. Including in the recent policies and programmes of the United Nations Organisations.

Sources of marine plastic

According to currently available estimate, 80 percent of marine plastic pollution originates from land-based sources with the remainder coming from ocean-based sources.

Land based sources	Ocean based sources
<ol style="list-style-type: none">1. Illegal dumping and inadequate waste management2. Industrial activity3. Insufficiently filtered wastewater4. Coastal littering5. Discharge of stormwater6. Combined sewer overflows7. Natural disasters	<ol style="list-style-type: none">1. Fishing2. Shipping3. Offshore oil and gas platforms; undersea explorations

Source: (https://www.imperial.ac.uk/media/imperial-college/grantham-institute/public/publications/briefing-papers/The-ocean-plastic-pollution-challenge-Grantham-BP-19_web.pdf)

Microplastics

Plastic marine debris less than 5 mm is classified as microplastics. Microplastics come from a variety of sources, including from larger plastic debris that degrades into smaller and smaller pieces.

In addition, microbeads, a type of microplastic, are very tiny pieces of manufactured polyethylene plastic that are added as exfoliants to health and beauty products, such as some cleansers and toothpastes. These tiny particles easily pass through water filtration systems and end up in the ocean and lakes, posing a potential threat to aquatic life.

Microbeads are not a recent problem. According to the United Nations Environment Programme, plastic microbeads first appeared in personal care products about fifty years ago, with plastics increasingly replacing natural ingredients. As recently as 2012, this issue was still relatively unknown, with an abundance of products containing plastic microbeads available in the market and lack of awareness on the part of consumers.

Many countries have started addressing this problem.

On December 28, 2015, President Obama signed the Microbead-Free Waters Act of 2015, banning plastic microbeads in cosmetics and personal care products.

Source: <https://oceanservice.noaa.gov/facts/microplastics.html>

Marine Pollution - Classroom demonstration



INTRODUCTION

Human societies inevitably generate immense amounts of waste arising from the production and utilization of food as well as industrial and consumer goods. A considerable amount of this waste eventually ends up in the oceans - it is either dumped directly in the oceans, or reaches the oceans either through the rivers or wind. Once in the oceans, it continues to concentrate and accumulate there as there is no way of removing the waste from there. The problem is so severe, that assisted by ocean currents, garbage has started accumulating in the oceans.

“Great Pacific Garbage Patch” created by the North Pacific Gyre is one such example. It was discovered between 1985 and 1988.

Eco-Schools Steps: Curriculum linkages, Inform and Involve

Curriculum Linkage: Science/ Environmental Studies/Social Science

It spans from the West Coast of North America to Japan.

Estimated to be twice the size of Texas, 7 million tons of garbage by weight, Up to 9 feet deep.

The lesson plan encourages students to investigate marine pollution. The learning processes includes hands on demonstration and classroom interaction.



9-12
Years

Objective:

Students will be able to

- explain that it is easy to pollute the oceans and difficult to clean/ treat them.

Time required/ Duration:

- **Classroom session 1:** 45 minutes for the teacher to do a classroom demonstration and background introduction to marine pollution and purpose of undertaking the particular demonstration with students.

Resources Required:

- Resources 1 and 2 will be useful for the teacher to prepare the background for the activity
- A bucket of water
- bowl/ dish and strainer
- Some dirt
- Detergent or liquid soap
- A toothpaste containing microbeads and / any other product containing microbeads
- Cooking oil, food colouring, candy/ chocolate wrappers, gloves
- Garbage/ trash bag



Activity

Classroom session **1**

- Tell the students that they will perform an activity together and discuss the observations.
- Place a bucket full of water on the desk and ask students to form a circle around it so that the bucket is visible to all.
- Distribute different things like detergent, toothpaste, dirt, oil, food colouring, wrappers, etc. to different children and ask them to throw these into the bucket of water.
- Ask students to put in the different types of waste one at a time. Record the time spent in putting in the different types of waste.
- Ask the students to remove the various things from the water - wrappers, detergent, toothpaste, etc. The strainer and gloves could be used for this purpose.
- Ask the students to observe and make a list of things that they are able to remove from the water and things which are not possible to remove from water through a physical process.
- Make a note of the time taken by students to remove various things from water.
- Explain to the students that they may not be able to remove things which have dissolved in water and this might require other processes.
- Give a background of marine pollution and its impacts. Resource 1 (How your clothes are poisoning our oceans and food supply) and Resource 2 (Did you know?) will be useful for the same.

Evaluation

Ask the students about the impacts of different products on marine life. Both products which have dissolved and those which had not. It would be possible to judge from their answers, whether they were able to grasp the concept of marine pollution and its impacts.

Resources

Resource 1

“How your clothes are poisoning our oceans and food supply” -

Common ground Environment

Leah Messinger
Mon 20 Jun 2016 22:36 BST

20,192 222

How your clothes are poisoning our oceans and food supply



▲ Microplastic pollution is devastating our oceans. New research indicates that the biggest culprit may be the shirt off your back Photograph: Getty Images

New studies show that alarming numbers of tiny fibers from synthetic fabrics are making their way from your washing machine into aquatic animals

Source: <https://www.theguardian.com/environment/2016/jun/20/microfibers-plastic-pollution-oceans-patagonia-synthetic-clothes-microbeads>

Resource 2

Did you know?

1. Washing your face or brushing your teeth can harm the ocean, yourself and your children.
2. 67 different microplastics are currently used by the industry (https://www.health.belgium.be/sites/default/files/uploads/fields/fpshealth_theme_file/microplastics_manual_voor_de_website_env2.pdf)
3. Microplastics can be found in different types of cosmetics
4. Labelling on products is not always easy for people to understand - the names are not recognised as microplastics, the text size is too small to be read and sometimes there is no list of ingredients!
5. Some products which have zero microplastics are indicated by the zero plastic inside symbol
6. Explore the list of products and details of whether they contain microplastics or not from the (<http://www.beatthemicrobead.org/product-lists/>)



Create your Marine Pollution Fact File



INTRODUCTION

A fact sheet, or a fact file is a presentation of data in a format which emphasizes key points concisely, usually using tables, bullet points and/or headings, on a single printed page. Fact sheets often contain product information, technical data, lists, statistics, answers to common questions (e.g. FAQs), educational material, or how-to, "do-it-yourself" advice. This lesson plan introduces students to prioritise and present information or facts that they will collect as part of their work on this lesson plan. The fact file will also serve as a document to create awareness.

Objectives:

Students will be able to

- identify different problems associated with marine pollution.
- create their marine pollution fact file.

Eco-Schools Steps: Environmental review, Curriculum linkages, Inform and Involve, Eco-Code

Curriculum Linkage: Science/ Environmental Studies/Social Science



Eco-Schools

13-16
Years

Time required/ Duration:

- **Classroom session 1:** 45 minutes for the teacher to do a background introduction, reading time for students followed by classroom discussion.
- **Home Assignment:** One week for individual students to do an internet based research and create a fact file.
- **Classroom Session 2:** 45 minutes for students to ready the display of their individual fact sheets on the Eco-Schools bulletin board.

Resources Required:

- Resource 6 (List of synthetic polymers which may occur as synthetic microparticles in a product or process)
- Student stationery and other writing material
- Internet
- Eco-Schools notice/ bulletin board, board pins



Activity

Classroom session 1

- Initiate a discussion introducing students to marine pollution and its impacts.
- Ask students to read through Resource 1, Human Impacts - Fact Sheet.
- Facilitate a discussion on the perspective gathered by the students on the same.

Home Assignment 1

- Allocate one week time to students to do an internet based research and create personalised ocean pollution fact file.
- Ask students to create their individual Eco-code (which will demonstrate actions for preventing marine pollution) and the same should also be displayed on the bulletin board.
- The individual fact files should be put up for display on the Eco-Schools bulletin board.

Classroom session 2

- Guide students to ready the display of their individual fact sheets and Eco-code on the Eco-Schools bulletin board.
- One month display time should be provided.

Evaluation

Student Eco-Code will help to understand whether they were able to understand the problems associated with marine pollution and write their action statement in the form of an Eco-code.

Resource 6

Human Impacts - Fact Sheet

Litter is ugly and dirty, but tin cans, aluminium cans, plastic objects and other non-biodegradable garbage are more than just an eyesore. Plastic, glass and aluminium take a long time to degrade. The sea contains large amounts of garbage that originates from the land, even far from the seashore. Garbage is often mistaken by marine animals for food. Turtles often mistake plastic bags for squid or jellyfish and it chokes them. Seabirds, marine mammals and fish can get entangled in abandoned fishing lines, plastic bags and six-pack rings and die.

Facts and figures on marine pollution

- Land-based sources (such as agricultural runoff, discharge of nutrients and pesticides and untreated sewage including plastics) account for approximately 80% of marine pollution, globally.
- Agricultural practices, coastal tourism, port and harbour developments, damming of rivers, urban development and construction, mining, fisheries, aquaculture, and manufacturing, among others, are all sources of marine pollution threatening coastal and marine habitats.
- Excessive nutrients from sewage outfalls and agricultural runoff have contributed to the number of low oxygen (hypoxic) areas known as dead zones, where most marine life cannot survive, resulting in the collapse of some ecosystems.
- There are now close to 500 dead zones covering more than 245,000 km² globally, equivalent to the surface of the United Kingdom.
- Over 220 million tons of plastic are produced each year.
- Plastics can contribute to reduce our carbon footprint. They provide improved insulation, lighter packaging, are found in phones, computers, medical devices, etc. but appropriate disposal is often not addressed.
- Seven of the EU Member States plus Norway and Switzerland recover more than 80% of their used plastics. These countries adopt an integrated waste and resource management strategy to address each waste stream with the best options. However, waste and disposal remain an issue in most of the world.
- The United Nations Environment Programme estimated in 2006 that every square mile of ocean contains 46,000 pieces of floating plastic.
- Once discarded, plastics are weathered and eroded into very small fragments known as microplastics. These together with plastic pellets are already found in most beaches around the world.
- Plastic debris causes the deaths of more than a million seabirds every year, as well as more than 100,000 marine mammals.
- Plastic materials and other litter can become concentrated in certain areas called gyres as a result of marine pollution gathered by oceanic currents. There are now 5 gyres in our ocean.
- The North Pacific Gyre, known as the Great Pacific Garbage Patch, occupies a relatively stationary area that is twice the size of Texas. Waste material from across the North Pacific Ocean, including coastal waters off North America and Japan, are drawn together.
- The Blueprint for ocean and coastal sustainability includes proposals to green the nutrient economy and reduce ocean hypoxia.

Source: <http://www.unesco.org/new/en/natural-sciences/ioc-oceans/focus-areas/rio-20-ocean/blueprint-for-the-future-we-want/marine-pollution/facts-and-figures-on-marine-pollution/>

Micro Solutions to Microplastics



INTRODUCTION

The lesson encourages investigation into the problem posed by microbeads and microplastics. The learning process includes reading and researching information pertaining to the topic, classroom interactions, group work, investigating awareness about the topic through personal interviews; analysing responses and communicating about the topic through an article.

Objectives:

Students will be able to

- explain the different problems associated with microbeads.
- analyze the problems associated with microbeads.
- list composition of microbeads in different products.
- interview and identify beliefs/perspectives on the problem of plastic waste.
- research the internet to find out about rules, education drives/campaigns in place to tackle the microbeads problem in different countries.
- prepare an article on the issue highlighting the problem, perspectives and solutions (laws, educational drives/campaigns etc.) to create awareness and promote action on micro-beads.

Eco-Schools Steps: Environmental review, Inform and Involve

Curriculum Linkage: Science/ Environmental Studies/Social Science



13-16
Years

Time required/ Duration:

- **Classroom Session 1:** 45 minutes to introduce the concept of microbeads, class based activity to list different products and their microbead constituents.
- **Classroom Session 2:** 45 minutes classroom based reading and discussion to understand the extent of the problem posed by microbeads.
- **Group Assignment 1:** 2-3 days provided for home based assignments to undertake internet based search and personal interviews.
- **Classroom Session 3:** 45 minutes classroom based interaction and analysis time.
- **Group Assignment 2:** Seven days provided for home based assignments for compiling and disseminating student articles.



Resources Required:

- Different types of personal care products including face wash, toothpaste, shaving creams, etc; some of these might be containing microbeads and others may not be
- Resource 1 “How your clothes are poisoning our oceans and food supply” - <https://www.theguardian.com/environment/2016/jun/20/microfibers-plastic-pollution-oceans-patagonia-synthetic-clothes-microbeads> Article from the International Edition of The Gaurdian. Based on the access to the internet, teachers can choose to view the article online or keeping sufficient copies to handout 1 article each to each of the groups. The teacher might have to provide 20 min reading time for the article
- Resource sheet 2 Did you know? - (going through the sheet and listed links - 20 min). The links mentioned in this document should be interesting reading material for students as part of the group assignments
- Resource 3: President Obama signs Microbead-Free Waters Act of 2015
- Resource 4: Investigate microbeads table
- Resource 5: Personal interview questionnaire
- Internet and Laptop
- Projector and screen (if laptops are not available)
- Resource 6: List of microplastic/micorbeads commonly used

Activity

Classroom session 1

- Introduce students to the concept of microbeads and microplastics and mention the different products in the market which contain these.
- Screen the video from the Story of Stuff Project <https://storyofstuff.org/plastic-microbeads-ban-the-bead/> (2.11 minutes duration). The video illustrates the problem posed by microbeads.
- Divide the class into groups of 3-4 students.
- Distribute to each group some of the products (personal care products including toothpaste, body wash, etc) she has got to the class.
- With the help of a magnifying glass ask the groups to search/look for the mention of different constituents representing microbeads in the list of ingredients mentioned on the packaging of these products. Each group should list these.
- Ask the students should to list these products and the constituents on the Eco-Schools bulletin board to create awareness.

Classroom session 2

- Students continue to work in groups constituted during the previous class.
- Teachers should guide the students to read the article “How your clothes are poisoning our oceans and food supply” from the link listed in Resource 1 and identify the ill effects of microplastics. (20 minutes should be set aside for groups to read this article).
- Further the teacher should get the students to read the Did you know? and the associated references for understanding different products containing different types of microbeads. (20 minutes for groups).
- Teacher discussion should help students consolidate the extent of the problem posed by microbeads.

Group Assignment 1

As part of this groups take up two major types of assignments (2-3 days time need to be provided to student groups to accomplish these tasks):

1. Internet based search:

- Internet based search to investigate rules and educational programmes that exist with regards to microbeads, minimum one country should be selected by a group.
- Students should then tabulate the information in the Investigate microbead table (Resource 4).

2. Conducting Personal interviews:

- Each student of each group needs to conduct one personal interview. Each group will thereby get 3-4 responses.
- The interview time with each respondent should be restricted to 20 minutes.
- The interview is conducted to understand the respondent's perspectives with regards to microbeads and microfibers.

Classroom session 3

- Provide student groups 45 minutes of classroom interaction to discuss and analyse their finding prior to getting into the reporting process.

Group Assignment 2

As part of this groups take up the assignment of reporting in the form an article (five hours over a week should be provided to student groups to accomplish this task):

- Students should continue to work in groups and report one article per group.
- The articles should be based on the analysis of their findings based on interview responses, classroom interaction and internet search.
- Students articles should present the problem, people perspective and solutions (laws, education drives, others) to create awareness and promote action on microbeads.
- Teachers should get student groups to share their articles to create awareness through a local newspaper, or share the same on the school social media page or share the same during an assembly in the school, etc.

- For article: Refer Lesson Plan 1 from chapter “Learning to be an Environmental Journalist”

Evaluation

A quick check in the form of question and answers with students prior to and after the activity to understand what they know about microbeads and how to look for them in different products.

Resources

Resource 3

US has a ban against microbeads, investigate the internet to search if other countries have introduced laws/ legislations/ others in this regard.

President Obama Signs *Microbead-Free Waters Act of 2015*

December 28, 2015

Washington D.C. – A federal law was passed and signed by President Obama that bans the production and sale of personal care products with plastic microbeads. Some personal care products, such as toothpaste and face wash, have plastic microbeads that can go down the drain and into the ocean. Scientists are not sure how microbeads affect the ocean environment. To stop more plastic from entering the ocean, congress decided to ban personal care products with microbeads, starting in 2017. Nobody will be allowed to make or sell personal care products with microbeads anywhere in the United States.

Resource 4

Country	Existing Laws pertaining to microbeads	Existing awareness programmes pertaining to microbeads

Resource 5

Personal interview questionnaire

1. Have you ever heard the term microbeads?

Yes No

2. What is a microbead?

.....
.....

3. Why are they being used?

.....
.....

4. What types of products contain microbeads?

.....
.....

5. Do you look for microbead labelling when you buy a personal care or other product?

Yes No

6. Do you know of any environmental risks associated with microbeads?

.....
.....

7. Do you know of any health risks associated with microbeads?

.....
.....

8. Would you prefer to buy a product which contains microbeads?

Yes No

9. Would you avoid a product which contains microbeads?

Yes No

10. Will you tell others about the problems associated with microbeads?

Yes No

11. What other personal steps would you to take to help resolve this problem?

.....
.....

Resource 6

List of synthetic polymers which may occur as synthetic microparticles in a product or process

Sl. No.	Prefix	Repeating unit	Abbreviation	Application as primary synthetic microparticle	Possible function
1	Poly	1,4-cis-Isoprene	-	Rubber	Natural rubber
2	Poly	2-hydroxyethyl methacrylate	HEMA	Paint, Drug	Drug delivery
3	Poly	2-hydroxypropyl methacrylate	HPMA	Paint, Drug	Drug delivery
4	Poly	Acrylate	PA	Cosmetics	Viscosity Controlling
5	Poly	Acrylonitrile	-	Synthetic rubber	Rubber
6	Poly	Acrylonitrile butadiene styrene	ABS	Drugs	Polymer granules for making of products
7	Poly	Actide	PLA	Drugs	Drug delivery
8	Poly	Alkyd resins	-	Paint	Paint binder
9	Poly	Alkyl stearate/vinyl acetate copolymers	-	Cosmetics	Film formation, hair fixative
10	Poly	Buthylene/Ethylene/Styrene copolymers	-	Cosmetics	Viscosity Controlling
11	Poly	Butyl acrylate	PBA	Drugs	Drug delivery
12	Poly	Butyl methacrylate	PMMA	Drugs	Sorbent for delivery of active ingredients
13	Poly	Butylene terephthalate	PBT	Cosmetics	Film formation, hair fixative
14	Poly	Caprolactam (Nylon 6)	-	Cosmetics	Bulking agent, viscosity controlling
15	Poly	Cellulose acetate	-	Cosmetics, paints, glue	Gelling and thickening agent
16	Poly	Cellulose nitrate	-	Cosmetics, paints, glue	Gelling and thickening agent
17	Poly	Chloroprene	CR	Rubber	
18	Poly	Dimethylsiloxane (silicone)	PDMS	Cosmetics, food bulking agent in medical applications	Film formation, viscosity controlling, bulking agent
19	Poly	Ethyleneimine	PEI	Drugs, cosmetics	Bulking agent, drug delivery
20	Poly	Ethylene -glycol	PEG	Drugs	Drugs delivery, semi - manufacture
21	Poly	Elastine -like polypeptide	ELP	Drugs	Drugs delivery
22	Poly	Epoxy resins	-	Paint, glue	
23	Poly	Ethyl acrylate	-	Paint, textiles, pharmaceuticals	
24	Poly	Ethyl methacrylate	-	Paint, glue	
25	Poly	Ethylene	PE	Paint, cleaning, tracing, leaving voids after burning	

26	Poly	Ethylene methylacrylate copolymer	-	Cosmetics	Film formation
27	Poly	Ethylene terephthalate	PET	Divers, cosmetics	Adhesive, film formation, hair fixation, viscosity controlling, aesthetic agent
28	Poly	Ethylene vinyl acetate	EVA	Glue	Adhesive
29	Poly	Ethylene/acrylate copolymer		Cosmetics	Viscosity agent
30	Poly	Ethylene/Propylene/ Styrene copolymers	-	Cosmetics	Viscosity agent
31	Poly	ϵ -caprolactone	-	Medical	Drug Delivery
32	Poly	Formaldehyde (oxymethylene)			
33	Poly	Gcolic acid	-		
34	Poly	Isobornyl acrylate	-		
35	Poly	Isobornyl methacrylate	-		
36	Poly	Isobutyl methacrylate			
37	Poly	Isobutylene			
38	Poly	Isoprene			
39	Poly	Lactic acid	PLA	Medical	Drug Delivery/ filling agent
40	Poly	Lauro lactam (Nylon 12 and Amide -12)	-	Cosmetics	Bulking, viscosity controlling, opacifying
41	Poly	Lauryl methacrylate			
42	Poly	Methacrylated hyaluronic acid	MA-HA	Drugs	Drug Delivery
43	Poly	Methacrylonitrile	MAN		
44	Poly	Methyl acrylate	OMA	Drugs	Drug Delivery
45	Poly	Methyl methacrylate	-		
46	Poly	n- Hexyl methacrylate	-	Paint, glue	
47	Poly	N- isopropylacrylamide	NIPAM	Drugs	Drug Delivery
48	Poly	Octyl methacrylate			
49	Poly	Pentaerythrityl terephthalate	-	Cosmetics	Film formation
50	Poly	Propyl acrylate	-		
51	Poly	Propyl methacrylate			
52	Poly	Propylene	PP	Macro plastic products, cosmetics	Polymer granules for making of products, Bulking agent, viscosity increasing agent
53	Poly	Propylene oxide		Macro plastic products,	
54	Poly	Propylene terephthalate	PPT	Diverse, Cosmetics	Emulsion Stabilising, Skin conditioning
55	Poly	Stearyl methacrylate	-	Coating textiles	
56	Poly	Styrene	PS	Macro plastic products, cosmetics, tracers	Film formation, polymer gradients
57	Poly	Styrene/ Acrylate copolymer		Cosmetics	Aesthetic coloured microspheres
58	Poly	Tetrafluoroethylene (Teflon)	PTFE	Lubricating agent in drilling fluid, cosmetics, bulking agent in medical applications	Bulking agent, slip modifier, binding agent, skin conditioner, lubrication, bulking agent in medical applications

59	Poly	Tetrahydrofuran	THF		Further processing chemicals
60	Poly	Trimethylsiloxysilicate (Silicone resin)	TMSS	Cosmetics	Film formation
61	Poly	Urethane	PUR	Cosmetics, paints, macro plastic products	Film formation, polymer granules for making of products
62	Poly	Vinyl acetate	PVA	Paints, coatings, textiles	Used for adhesivedition
63	Poly	Vinyl alcohol	PVOH	Paint	Stabiliser
64	Poly	Vinyl chloride	PVC	Macro plastic products	polymer granules for making of products
65	Poly	Vinylidene chloride	PVDC	Coating, cleaning	Used as water based coating
66	Poly	Vinylpolypyrrolidon	PVPP	Clarifier	Clarifying of beverages e.g. beer, wine, fruit juices
67	Poly	Ethylene vinyl alcohol opolymer	Tegress	Medical bulking agent	

Find out which of the above has a natural alternative available.

E- waste

Before you Begin

Electronic Waste, or E-waste, refers to all items of electrical and electronic equipment (EEE) and its parts that have been discarded by its owner as waste without the intent of re-use (Step Initiative 2014).

The Global E-waste Monitor – 2017 describes six different categories of E-waste.

1. Temperature exchange equipment, (commonly referred to as cooling and freezing equipment). Typical equipment includes refrigerators, freezers, air conditioners, heat pumps.
2. Screens and monitors. Typical equipment includes televisions, monitors, laptops, notebooks, and tablets.
3. Lamps. Typical equipment includes fluorescent lamps, high intensity discharge lamps, and LED lamps.
4. Large equipment. Typical equipment includes washing machines, clothes dryers, dish-washing machines, electric stoves, large printing machines, copying equipment and photovoltaic panels.
5. Small equipment. Typical equipment includes vacuum cleaners, microwaves, ventilation equipment, toasters, electric kettles, electric shavers, scales, calculators, radio sets, video cameras, electrical and electronic toys, small electrical and electronic tools, small medical devices, small monitoring and control instruments.
6. Small IT and telecommunication equipment. Typical equipment includes mobile phones, Global Positioning Systems (GPS), pocket calculators, routers, personal computers, printers, telephones.

How is E-waste generated?

Electronics waste, is the waste generated from surplus, broken and obsolete electronic devices. Also the different categories of products mentioned above produce different types of waste. The production of waste depends on the life of the product, on technological advancements and also on social and economic developments.

Why is E-waste of concern?

E-waste contains hazardous substances that, if treated inappropriately at end-of-life, can damage human health and the environment. It also contains complex valuable materials, such as precious metals which need to be treated properly to effectively recover them with minimal environmental impact and in the process reduce the demand for such material through mining.

The mounting problem

There are several reasons for the mounting E-waste problem. These include rapid technological advancements, social and economic development, and more spending power to buy a variety of electronic products.

The statistics!

The Global E-waste Monitor – 2017, reported a staggering amount of e-waste generated in 2016. According to the report 44.7 million metric tonnes of E-waste was generated in 2016. This is an equivalent of almost 4500 Eiffel Towers! The statistics are even more overwhelming as globally, only 8.9 Mt or 20 percent of the total E-waste generated is documented to be collected and recycled.

E-waste recycling

E-waste or electronics recycling is the process of recovering material from old devices to use in new products. Electronics are full of valuable materials including copper, tin, iron, aluminum, fossil fuels, titanium, gold, and silver. Many of the materials used in making these electronic devices can be recovered, reused and recycled, including plastics, metals, and glass.

The problem is however severe as the production of E-waste rates are not matching their recycling rates. The Global E-waste Monitor – 2017 mentions that only 41 countries have Official E-waste Statistics. The fate of a large majority of the E-waste (34.1 Mt) is simply unknown. The report goes on to state that “In countries where there is no national e-waste legislation in place, E-waste is likely treated as other or general waste. This is either land-filled or recycled, along with other metal or plastic wastes. There is the high risk that the pollutants are not taken care of properly, or they are taken care of by an informal sector and recycled without properly protecting the workers, while emitting the toxins contained in E-waste.”

E-waste: A Resource?

Lesson 1 Plan

INTRODUCTION

The lesson plan introduces students to the different resources including precious metals which could be recovered from E-waste if it is recycled efficiently.

Objectives:

Students will be able to

- list the different types of materials which could be recovered from E-waste.
- identify and mark on the periodic table various materials which could be recovered from E-waste.

Eco-Schools Steps: Environmental review, Curriculum linkages, Inform and Involve

Curriculum Linkage: Science/ Environmental Studies/Social Science/Chemistry

Time required/ Duration:

- **Classroom Session 1:** 45 minutes for the teacher to do a background introduction on e-waste followed by internet based investigation and classroom work.
- **Home Assignment:** Two days for a home based interaction with parents.
- **Classroom Session 2:**
 - 90 minutes to put up a display on the Eco-Schools bulletin board
 - The display could be kept for two to four weeks.

Resources Required:

- Resource 3 (The value of E-waste)
- Internet
- Writing materials
- Bulletin board/ board pins
- Laptop/Computers



Eco-Schools

13-16
Years



Activity

Classroom session 1

- Start with a discussion introducing students to E-waste specifically introducing the different materials which can be recovered from E-waste.
- Divide the class into groups of 3-4 students.
- Guide the students to undertake an online search to investigate the different types of materials (inventory of chemicals - precious and others) which can be recovered from E-waste. Resource 3 (The value of E-waste) and Resource 4 (Periodic Table), can also be used by students to initiate the process.
- Following the research students should mark on the periodic table the different types of elements which can be recovered, if the E-waste is routed efficiently. Periodic table from Resource 5 (Blank Periodic Table) can be made use of for the same.

Home Assignment 1

- Ask individual students to carry home their periodic tables and discuss the same with their parents.

Classroom session 2

- Ask students to prepare for a display of the work on the Eco-Schools bulletin board to highlight the importance of an efficient E-waste recovery process.

Evaluation:

A quiz could be organized by the teacher to assess the understanding of the importance of the different types of materials.

Resource 3

The value of E-waste

A large variety of valuable materials and plastics are contained in electric and electronic appliances. Up to 60 elements from the periodic table can be found in complex electronics, and many of them are technically recoverable, though there are economic limits set by the market. E-waste contains precious metals including gold, silver, copper, platinum, and palladium, but it also contains valuable bulky materials such as iron and aluminium, along with plastics that can be recycled.

E-waste also contains rare earth, hazardous, and scarce metals. Common hazardous materials found in E-waste are: heavy metals (such as mercury, lead, cadmium etc.) and chemicals (such as CFCs/ chlorofluorocarbon or various flame retardants).

Proper management systems of E-waste also need to be established to allow for the recovery of the impressive value of precious and valuable materials contained in discarded equipment. In order to exploit this opportunity and simultaneously mitigate pollution, good policies are needed to facilitate the creation of an infrastructure and encourage the recovery of valuable materials.

Pollutants and their occurrence in waste electrical and electronic equipment

Pollutant	Occurrence
Arsenic	Semiconductors, diodes, microwaves, LEDs (Light-emitting diodes), solar cells
Barium	Electron tubes, filler for plastic and rubber, lubricant additives
Brominated flame proofing agent	Casing, circuit boards (plastic), cables and PVC cables
Cadmium	Batteries, pigments, solder, alloys, circuit boards, computer batteries, monitor cathode ray tubes (CRTs)
Chrome	Dyes/pigments, switches, solar
Cobalt	Insulators
Copper	Conducted in cables, copper ribbons, coils, circuitry, pigments
Lead	Lead rechargeable batteries, solar, transistors, lithium batteries, PVC (polyvinyl chloride) stabilizers, lasers, LEDs, thermoelectric elements, circuit boards
Liquid crystal	Displays
Lithium	Mobile telephones, photographic equipment, video equipment (batteries)
Mercury	Components in copper machines and steam irons; batteries in clocks and pocket calculators, switches, LCDs
Nickel	Alloys, batteries, relays, semiconductors, pigments
PCBs (polychlorinated biphenyls)	Transformers, capacitors, softening agents for paint, glue, plastic
Selenium	Photoelectric cells, pigments, photocopiers, fax machines
Silver	Capacitors, switches (contacts), batteries, resistors
Zinc	Steel, brass, alloys, disposable and rechargeable batteries, luminous substances

Source (http://rajyasabha.nic.in/rsnew/publication_electronic/E-Waste_in_india.pdf)

Potential value of raw materials in E-waste in 2016

Material	Kilotons (kt)	Value (\$)
Fe	16,283	3,582
Cu	2,164	9,524
Al	2,472	3,585
Ag	1.6	884
Au	0.5	18,840
Pd	0.2	3,369
Plastics	12,230	15,043

Source: (https://colleGlobal-E-waste_Monitor_2017__electronic_single_pages_.pdfctions.unu.edu/eserv/UNU:6341/)

Resource 5

Blank Periodic Table

PERIODIC TABLE OF THE ELEMENTS

1	IA																	18	VIIIA	
1																				2
2		2	IIA																	
3																				
4																				
5																				
6																				
7																				

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57	58	59	60	61	62	63	64	65	66	67	68	69	70	71
89	90	91	92	93	94	95	96	97	98	99	100	101	102	103

Source: <https://www.periodni.com/images.html>

References

Baldé, C.P., Forti V., Gray, V., Kuehr, R., Stegmann, P. : *The Global E-waste Monitor – 2017*, United Nations University (UNU), International Telecommunication Union (ITU) & International Solid Waste Association (ISWA), Bonn/Geneva/Vienna. ISBN ISBN
Printed Version: 978-92-808-9053-2 ISBN Electronic Version: 978-92 https://collections.unu.edu/eserv/UNU:6341/Global-E-waste_Monitor_2017__electronic_single_pages_.pdf
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<http://ewastemonitor.info/>

Global Treaties, Policies and Legislations pertaining to waste

Before you Begin

Waste as we have come to understand are materials that are unwanted or unusable that get discarded. We have also learnt that what is waste for one person, may not necessarily be the same for another. The term waste is also applicable to different types of materials including municipal, hazardous, biomedical, industrial, E-waste, to name a few. Based on its nature, waste can also be toxic, hazardous, inert or infectious. The nature of the waste and the volume in which waste is being produced today, has put immense pressure on our environment.

Waste type, quantity of waste generated, how and where it is disposed, its nature (hazardous or infectious) which sometimes makes it mandatory to be handled with care. How it is collected, transported and treated are some of the other questions which arise around “waste”.

A number of laws and legislations are in place which look at waste management. These govern the transport, treatment, storage, and disposal of waste. These laws look at minimising or controlling indiscriminate dispersal of waste; reduce ecological or biological harm; mandate waste recycling or even mandate where the waste can or cannot be disposed.

Different conventions and laws have been put together for waste management, some of these are:-

- Convention on Civil Liability for Damage Caused during Carriage of Dangerous Goods by Road, Rail, and Inland Navigation Vessels (CRTD), Geneva, 1989
- Convention on the Control of Transboundary Movements of Hazardous Wastes and their Disposal, Basel, 1989
- Convention on the Ban of the Import into Africa and the Control of Transboundary Movements and Management of Hazardous Wastes Within Africa, Bamako, 1991
- Convention on the Prior Informed Consent Procedure for Certain Hazardous Chemicals and Pesticides in International Trade, Rotterdam, 1998
- Convention on the Transboundary Effects of Industrial Accidents, Helsinki, 1992
- European Agreement Concerning the International Carriage of Dangerous Goods by Inland Waterways (AND), Geneva, 2000
- European Agreement Concerning the International Carriage of Dangerous Goods by Road (ADR), Geneva, 1957
- FAO International Code of Conduct on the Distribution and Use of Pesticides, Rome, 1985
- Minamata Convention on Mercury, Minamata 2013
- Stockholm Convention Stockholm Convention on Persistent Organic Pollutants Stockholm, 2001
- Convention to Ban the Importation into Forum Island Countries of Hazardous and Radioactive Wastes and to Control the Transboundary Movement and Management of Hazardous Wastes within the South Pacific Region, Waigani, 1995

The Microbead-Free Waters Act are examples of some of the different types of laws and legislations governing waste that are applicable in different locations.

Waste and Law



INTRODUCTION

Being aware of the laws is an important component of “Citizenship Education”. With our “Rights” we have our “Responsibilities”. With the waste becoming a global problem that is effecting our oceans at a scale that can threaten wild life and the larges source of food supply, it is important to be aware of the laws at various levels - local to global for better compliance.

The lesson plan encourages research of laws related to waste that can encourage better compliance and responsible global citizenship.

Objectives:

Students will be able to

- record an inventory of laws related to waste.
- create a display of the different types of laws related to waste.

Eco-Schools Steps: Environmental review, Curriculum linkages, Inform and Involve

Curriculum Linkage: Science/ Environmental Studies/Social Science

Time required/ Duration:

- **Classroom Session 1:** 45 minutes to do a background introduction on waste and law.
- **Group Assignment:** Five hours over a week for students to undertake internet based research and identify different laws pertaining to waste.
- **Classroom Session 2:** 90 minutes to summarise and students to prepare the Eco-Schools display board along with one month display time.

Resources Required:

- Resource 1 (Resource Conservation and Recovery Act)
- Internet
- Writing Materials



13-16
Years



Activity

Classroom session 1

- Start with a discussion introducing students to waste and law.
- Divide the class into groups of 3-4 students.
- Guide students to undertake internet based search on the different types of laws and legislations pertaining to waste. Different groups can be assigned different aspects so as to avoid overlaps
 - Laws could be pertaining to category of waste.
 - Laws could be pertaining to collection of waste.
 - Laws could be pertaining to disposal of waste - how and where?
 - Laws could be related to littering and such behaviours.

Teachers should provide one week for each group to further research and collate information about laws relevant to waste.

Classroom session 2

- Ask students to summarise and share their research work.
- Discuss what is the responsibility of a common citizen in enforcement of laws.
- Brainstorm on why some of the laws do not work and what can be done to create more compliance.
- Guide the groups to organise the information collected to inform the students of the schools.
- Ask the students to create a display with information pertaining to waste and law on the Eco-Schools bulletin board.

Evaluation:

Teachers could evaluate the lesson plan based on the content of the display board.

About the Foundation for Environmental Education (FEE)

With members in 76 countries around the world, FEE's programmes represent the cutting edge in Education for Sustainable Development and Environmental Education. It is the vision of the Foundation for Environmental Education that its programmes empower people everywhere to live sustainably and in an environmentally conscious manner.



About the Wrigley Company Foundation

The Wrigley Company Foundation has awarded more than \$70 million USD since its establishment in 1987. With a focus on oral health, the environment, particularly education for litter prevention, and improving Wrigley's site and sourcing communities, it works to build brighter futures around the world.

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