

**SECONDARY SCHOOL STUDENTS' AWARENESS ON PLASTIC
POLLUTION AND ENVIRONMENTAL EDUCATION : A STUDY**

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Abstract :

In the last 60 years, plastic has become a useful and versatile material with a wide range of applications. Its uses are likely to increase with developments in the plastic industry. In the future, plastic could help address some of the world's most pressing problems, such as climate change and food shortages. Plastic is still a relatively new material, which means the problem of plastic waste has only recently been realized, as knowledge about its environmental persistence. Even more recent is the discovery of possible health and environmental effects, such as the impacts of the chemicals contained in plastic. The monitoring of plastic waste and research into its impacts are still in their infancy.

Plastic pollution involves the accumulation of plastic products in the environment that adversely affects wildlife, wildlife habitat, or humans. Many types and forms of plastic pollution exist. Plastic pollution can adversely affect lands, waterways and oceans. Plastic reduction efforts have occurred in some areas in attempts to reduce plastic consumption and promote plastic recycling. The prominence of plastic pollution is correlated with plastics being inexpensive and durable, which lends to high levels of plastics used by humans.

Environmental education uses environmental issues and topics as a theme to weave into all subjects and grades. This ensures all students will have many opportunities to acquire the knowledge, skills, perspectives and practices they need to become environmentally literate citizens. There will also be opportunities for students to address environmental issues in their homes, in their local communities, or at the global level.

The present study was aims to investigate the concept of environmental awareness in plastic pollution of secondary school students of Hooghly District. Concept and attitude of environment awareness in plastic pollution measure by questionnaire was used to assess their environment awareness. The data were analyzed with the help of statistical techniques like Mean, Standard deviation and t-value. The result of Analysis shows that, there exists no significant

difference in plastic pollution awareness among secondary school student. Urban students are more aware in noise pollution than rural school student in Hooghly district.

Key Words : Environmental Awareness, plastic pollution, Environmental Education, Statistical treatment, significant difference.

Introduction :

Most plastics contain other organic or inorganic compounds blended in. The amount of additives ranges from zero percentage for polymers used to wrap foods to more than 50% for certain electronic applications. The average content of additives is 20% by weight of the polymer. Fillers improve performance and/or reduce production costs. Stabilizing additives include fire retardants to lower the flammability of the material. Many plastics contain fillers, relatively inert and inexpensive materials that make the product cheaper by weight. Typically fillers are mineral in origin, e.g., chalk. Some fillers are more chemically active and are called reinforcing agents. Since many organic polymers are too rigid for particular applications, they are blended with plasticizers (the largest group of additives, oily compounds that confer improved rheology. Colorants are common additives, although their weight contribution is small. Many of the controversies associated with plastics are associated with the additives Organotin compounds are particularly toxic. Due to their relatively low cost, ease of manufacture, versatility, and imperviousness to water, plastics are used in an enormous and expanding range of products, from paper clips to spaceships. They have already displaced many traditional materials, such as wood, stone, horn and bone, leather, paper, metal, glass, and ceramic, in most of their former uses.

In developed countries, about a third of plastic is used in packaging and another third in buildings such as piping used in plumbing or vinyl siding. Other uses include automobiles (up to 20% plastic), furniture, and toys. In the developing world, the ratios may be different - for example, reportedly 42% of India's consumption is used in packaging.

Plastic wastes clog the drains and thus hit especially urban sewage systems. The plastic wastes being dumped into rivers, streams and sea contaminate the water, soil, marine life and also the air we breathe. Choked drains provide excellent breeding grounds for mosquitoes besides causing flooding during the monsoon. Since plastic does not undergo bacterial decomposition, land filling using plastic would mean preserving the poison forever. Any attempt to get rid of plastic through landfills is also dangerous. Apart from toxic seepage from the landfill resulting in

the contamination of precious water sources, the waste mass impedes the flow of ground water. Landfills are also prone to leaks. The wastes, especially cadmium and lead in the wastes, invariably mix with rain water, then seep through the ground and drain into nearby streams and lakes and other water bodies. Thus the water we use gets poisoned.

The only way to overcome the deadly and lasting danger of plastic pollution is to cut down the use of plastic, if possible avoid it altogether. Say NO to plastic whenever and wherever we can. Prefer to carry our own bags for grocery shopping, a jute or cloth bag. All attempts made to put an end to plastic pollution will be a REAL BENEFIT for children. Let us contribute our part, save our environment from plastic pollution and make it a better environment for future.

Plastic causes serious damage to environment during its production process and during its disposal process. So the only way to reduce the hazards of plastic pollution is to reduce the use of plastic and thereby force a reduction in its production. The major chemicals that go into the making of plastic are highly toxic and pose serious threat to living beings of all species on earth. Some of the constituents of plastic such as benzene and vinyl chloride are proved to cause cancer, and other gases and liquid hydrocarbons spoil earth and air. The noxious substances emitted during the production of plastic are synthetic chemicals like ethylene oxide, benzene and xylenes. Besides hitting hard the ecosystem which is already fragile, these chemicals can cause an array of maladies ranging from birth defects to cancer, damage the nervous system and the immune system and also adversely affect the blood and the kidneys. And, many of this toxic substance are emitted during recycling of plastic too. The recycled plastic degrades in quality and necessitates the production of more new plastic to make the original product.

When plastic is burned, it has its own disadvantages. When burned, plastic releases a host of poisonous chemicals including dioxin into the air. Apart from these dangers, recycling of plastic is very uneconomical, dirty and labour intensive as has been revealed by studies conducted by many 'Public Interest Research Groups'. Recycling of plastic is associated with skin and respiratory problems resulting from exposure to and inhalation of toxic fumes, especially hydrocarbons and residues released during the process.

The roots of environmental education can be traced back as early as the 18th century when Jean-Jacques Rousseau stressed the importance of an education that focuses on the environment in *Emile: or, On Education*. Several decades later, Louis Agassiz, a Swiss-born naturalist, echoed Rousseau's philosophy as he encouraged students to "Study nature, not books." These two influential scholars helped lay the foundation for a concrete environmental education program, known as nature

study, which took place in the late 19th century and early 20th century.

Internationally, environmental education gained recognition when the UN Conference on the Human Environment held in Stockholm, Sweden, in 1972, declared environmental education must be used as a tool to address global environmental problems. The United Nations Education Scientific and Cultural Organization (UNESCO) and United Nations Environment Program (UNEP) created three major declarations that have guided the course of environmental education.

In secondary school, environmental curriculum can be a focused subject within the sciences or is a part of student interest groups or clubs and it can be considered its own field within education, environmental studies, environmental science and policy, ecology, or human/cultural ecology programs.

Environmental education is not restricted to in-class lesson plans. There are numerous ways children can learn about the environment in which they live. From experiential lessons in the school yard and field trips to national parks to after-school green clubs and school wide sustainability projects, the environment is a topic which is readily and easily accessible. Furthermore, celebration of Earth Day or participation in EE week (run through the National Environmental Education Foundation) is a great way to dedicate your lessons to environmental education. To be most effective, promote a holistic approach and lead by example, using sustainable practices in the classroom and school grounds and encouraging students and parents to bring environmental education into their home.

Issues, topics and potential learning opportunities in sustainability and the environment are all around us. We can explore a range of classroom strategies, planning ideas and exciting learning experiences for inspiration in developing learning for a sustainable future with our students.

1. These sustainability-focussed resource ideas are cross-curricular, and demonstrate some possible approaches in classroom teaching and learning.
2. These teaching tools can be used across the curriculum, and adapted for all year levels to support sustainability-focussed teaching and learning
3. The Guidelines provide useful information for planning education for sustainability teaching and learning programmes.

Classification :

Plastics are usually classified by their chemical structure of the polymer's backbone and side chains. Some important groups in these classifications are the acrylics, polyesters, silicones,

polyurethanes, and halogenated plastics. Plastics can also be classified by the chemical process used in their synthesis, such as condensation, poly-addition, and cross-linking.

Thermoplastics and thermosetting polymers :

There are two types of plastics: thermoplastics and thermosetting polymers. Thermoplastics are the plastics that do not undergo chemical change in their composition when heated and can be molded again and again. Examples include polyethylene, polypropylene, polystyrene and polyvinyl chloride.^[6] Common thermoplastics range from 20,000 to 500,000 amu, while thermosets are assumed to have infinite molecular weight. These chains are made up of many repeating molecular units, known as *repeat units*, derived from *monomers*; each polymer chain will have several thousand repeating units.

Thermosets can melt and take shape once; after they have solidified, they stay solid. In the thermosetting process, a chemical reaction occurs that is irreversible. The vulcanization of rubber is a thermosetting process. Before heating with sulfur, the poly-isoprene is a tacky, slightly runny material, but after vulcanization the product is rigid and non-tacky.

Toxicity of Plastic :

Pure plastics have low toxicity due to their insolubility in water and because they are biochemically inert, due to a large molecular weight. Plastic products contain a variety of additives, some of which can be toxic. For example, plasticizers like adipates and phthalates are often added to brittle plastics like polyvinyl chloride to make them pliable enough for use in food packaging, toys, and many other items. Traces of these compounds can leach out of the product. Owing to concerns over the effects of such leachates, the European Union has restricted the use of DEHP (di-ethylhexyl phthalate) and other phthalates in some applications. Some compounds leaching from polystyrene food containers have been proposed to interfere with hormone functions and are suspected human carcinogens. Other chemicals of potential concern include alkyl phenols. Whereas the finished plastic may be non-toxic, the monomers used in the manufacture of the parent polymers may be toxic. In some cases, small amounts of those chemicals can remain trapped in the product unless suitable processing is employed. For example, the World Health Organization's International Agency for Research on Cancer (IARC) has recognized vinyl chloride, the precursor to PVC, as a human carcinogen.

Environmental hazards due to plastic pollution:

1. **Littering of the landfills** and other open spaces with plastic garbage becomes unhygienic

and ugly,

2. **Littering of plastics** in the form of plastic bags causes blocking of the cities, municipalities sewerage systems leads to spreading of water borne diseases and increasing the cost of sewage maintenance systems.
3. **Soil fertility is also affected due to plastic material** as it forms part of manure remaining in the soil for years without natural degradation
4. **Death of animals** due to suffocation, stomach and intestine related diseases is a common feature mostly in developing economies due to improper disposal of plastic food bags that are eaten by these animals.
5. **Plastic waste is finding its way into the rivers**, oceans and seas of the world due to which the rich marine life is facing serious health hazards. Marine animals like fish, sea birds, otters and other marine species are swallowing these plastic wastes as food items that are leading to a premature death of these precious marine species.
6. **Pollution of environment by industries** manufacturing the plastic materials is another serious issue that is facing the environmentalists and the governments globally. The manufacturers of **plastic materials are polluting the environment** by disposing of the **plastic waste** and chemicals used in the process of manufacturing plastic material into nearby water channels and open spaces thereby causing health hazards as well as environmental pollution in a vast area.
7. **The laws requiring** these manufactures to install anti-pollution machinery at their premises is not being strictly adhered to by these people.

Climate change due to plastic pollution :

The effect of plastics on global warming is mixed. Plastics are generally made from petroleum. If the plastic is incinerated, it increases carbon emissions; if it is placed in a landfill, it becomes a carbon sink. Although biodegradable plastics have caused methane emissions. Due to the lightness of plastic versus glass or metal, plastic may reduce energy consumption. For example, packaging beverages in PET plastic rather than glass or metal is estimated to save 52% in transportation energy.

Environmental education should enable students to :

- define such fundamental concepts as environment, community, development, and technology, and apply these definitions in local, national, and global contexts;

- use a range of resources, communications skills, and technologies in addressing environmental questions;
- develop problem-solving skills and critical and creative thinking skills, including the ability to reason and apply logic, to recognize and apply abstract patterns, to identify connections and relationships between ideas and issues, and to test ideas against new information and against personal experience and beliefs;
- work towards a negotiated consensus when there are differences of opinion;
- detect and assess bias and evaluate different points of view;
- Recognize the need to incorporate an environmental perspective in decision making models.

Area of study :

The study area is Hooghly is one of the most economically developed districts in West Bengal. It is also the main jute cultivation, jute industry, and jute trade hub in the state. There are also a number of industrial complexes including one of the largest car manufacturing plants in India, the 'Hindustan Motors' plant located in Uttarpara. The jute mills are located along the banks of the river Hooghly in Tribeni, Bhadreswar, Champdani and Sreerampur.

The district is a completely flat land with no place having more than an elevation of 200 meters. The River Hooghly borders it to the east. Another major river is 'Damodar'. The district is bordered by Howrah District to the south, Bardhaman District to the north, and to the east by the River Hooghly. Bankura District lies to the north-west, with Medinipur District to the south-west. Hugli-Chuchura is the district headquarters.

Objectives :

1. To measure the environmental awareness level among secondary school student
2. To study the general environmental awareness in plastic pollution and environmental practices among the school students
3. To know the level of attitude towards environmental awareness on plastic pollution of postgraduate students.

Assumptions :

1. Secondary students completed class VIII.
2. Secondary students are now in class IX.
3. All the students are age of 15-16 years.

Hypothesis :

1. There is no significant mean difference in awareness on plastic pollution among Urban and rural students in secondary level.
2. There is no significance difference in awareness on plastic pollution among urban boys and urban girls in secondary level.
3. There is no significance difference in awareness on plastic pollution among rural boys and rural girls in secondary level.
4. There is no significance difference in awareness on plastic pollution among urban boys and rural boys in secondary level.
5. There is no significance difference in awareness on plastic pollution among urban girls and rural girls in secondary level.

Methodology :

The following steps and procedure adopted in conducting the study.

Research Design :

The volunteer sample in the study (N=160) consisted of 80 male and 80 female secondary school students. The mean age of participants was 15 years. Each participants completed a test and retest questionnaire.

Instrument :

A questionnaire adapted by self was used to collect data. The 30 item questionnaire focuses on the awareness in plastic pollution concerns. Each participant completed this questionnaire. The questionnaire addresses four dimensions: Environment, awareness, plastic pollution and environmental education. Each item contains 1 mark. The validity of the questionnaire was established by a review of three experts in educational technology. Selected items were revised based upon their comments and recommendations.

Procedure :

Data were collected from students score.

Data Analysis :

The questionnaire was used to assess secondary school student's environmental awareness in plastic pollution. A paired t-test was used to compare means score of male and female students. A

one-way ANOVA was used to compare means among grades. The test was used to identify the source of significant differences at 0.05 level of confidence.

Selection of sample :

For this study 160 secondary students from two secondary urban schools and two secondary rural schools of Hooghly district are selected. Sample distribution is given below.

Group	Urban school	Rural school	Total
Secondary Boys student	40	40	80
Secondary Girls student	40	40	80
Total	80	80	160

Tool :

In this study we used the descriptive method. Data were collected with a quantitative data collection technique. Plastic pollution awareness questionnaire was constructed by the investigator and was used in this study. The tool consists of 30 items in the form of objective type questions. The correctly answered questions will get one mark each. Therefore 30 marks are the maximum score and zero is the minimum score. Students answered the test paper questions. The student needed an average 45 minutes to finish it. The data was used only for the purpose of this study. The questionnaire covered with plastic pollution related issues.

Reliability of the Tool :

For reliability of the tool, we used Test-retest method. Retest was taken after 20 days and the correlation is 0.85 ($r=0.85$).

Validity of the Tool :

At the initial stage we choose 35 items for the questionnaire. After content validation 30 items are drafted.

Result :**Table 1 :** Mean, standard deviation and t-value for Awareness on plastic pollution of rural boys and rural girls in secondary level

Group	Sum	Mean	SD	SE	t	p	Remark	Level
Rural boys	746	18.65	3.58	0.57	-0.0596	0.9526	significant	0.05
Rural girls	744	18.60	3.91	0.62				

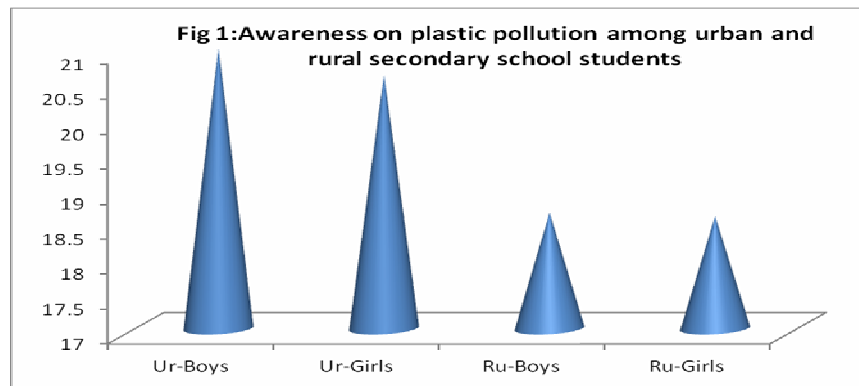
Table 2: Mean, standard deviation and t-value for awareness on plastic pollution of urban boys and urban girls in secondary level

Group	Sum	Mean	SD	SE	t	p	Remark	Level
Urban boys	840	21.0	2.287	0.362	-0.79698	0.4279	significant	0.05
Urban girls	825	20.62	1.904	0.301				

Table 3 : Percentage of awareness on plastic pollution of urban students and rural students in secondary level

Group	N	Mean score	Percentage of awareness
Urban boys	40	21.0	70%
Urban girls	40	20.62	69%
Rural boys	40	18.65	62.1%
Rural girls	40	18.60	62%

The above table shows that the mean scores of environmental awareness in plastic pollution secondary (Rural and Urban) male and female students are 18.65, 18.60, 21.0 and 20.62 respectively. The observed t-values are -0.0596 and -0.796 which are less than the theoretical t-value 1.97 at 0.05 level of significance. Hence, the null hypothesis is hypothesis is accepted. Therefore, there is no significant difference in plastic pollution awareness among secondary students. Urban boys and urban girls' secondary students have almost same percentage of plastic pollution awareness. Rural boys and rural girls' secondary students have also same percentage of plastic pollution awareness.



The above cone diagram shows that there exists no basic difference in plastic pollution awareness among rural boys and rural girls in secondary level. The figure shows that secondary urban boys and urban girls have same plastic pollution awareness. Urban secondary students are more aware in radioactive pollution than rural students.

Findings :

1. There is significant mean difference in awareness in plastic pollution among Urban and rural students in secondary level.
2. Secondary urban students have significantly higher awareness than secondary rural student about plastic pollution.
3. Urban boys and urban girls in secondary level have same awareness on plastic pollution.
4. Rural boys and rural girls in secondary level have same awareness on plastic pollution.
5. Urban boys are more aware than rural boys and rural girls' student about plastic pollution.
6. Rural boys are less aware than urban boys and urban girls' student about plastic pollution.

Limitation of the study :

1. The study was limited to a few schools.
2. The sample of the study was restricted to 120 postgraduate students only.
3. The research was limited only to Hooghly District of West Bengal due to shortage of the time.
4. The reliability of the awareness of radioactive pollution scale was determined only by test-retest method due to shortage of time
5. Only the content validity of the scale was determined.
6. The difference in the mean score of radioactive pollution awareness was found out only by t-test.

Suggestions for future study :

1. The scale of awareness in Plastic pollution can be standardized on the basis of large samples.
2. A similar study can be conducted by including larger samples from various schools of West Bengal or other state of India.
3. This work will be applicable on different college and university students.
4. Other independent variable like age, cast and region etc. will be considered for future study.
5. The study can be conducted upon common people not only the pupils.

Conclusion :

Secondary rural students are less aware than secondary rural students about plastic pollution in Hooghly District. There is an urgent need that the central Government of India should manage to get a legislation passed for the control of plastic pollution. Majority of the secondary in Hooghly district are found to be in the average level in their knowledge in plastic pollution and environmental education awareness. Suitable activities and curriculum related to the environment that are developed and used by the teachers would certainly bring proper attitude in the minds of the students.

Recommendations :

1. Students will gain a greater understanding of the need to carefully use all resources in ways that are not wasteful and damaging to the environment —both now and in the future.
2. Students will gain a greater understanding of the threats facing a variety of organisms, including endangered species, and the need to reduce plastic pollution.
3. Students will understand that they can personally play an important role in reducing plastic pollution and increasing recycling rates for a healthier environment.
4. Students will gain a greater understanding of the different types of plastics, and which can and cannot be recycled.
5. Students will learn more about different states of matter and how plastic can be changed into different states and reformed during the recycling process.
6. Students will understand that recycling involves a firsthand commitment to making the environment healthier.

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Summary :

Plastic is one of the major toxic pollutants of our time. Being composed of toxic chemicals and most importantly a non biodegradable substance, plastic pollutes earth and leads to air pollution and water pollution. There is no safe way to dispose plastic waste.

Plastic wastes clog the drains and thus hit especially urban sewage systems. The plastic wastes being dumped into rivers, streams and sea contaminate the water, soil, marine life and also the air we breathe. Choked drains provide excellent breeding grounds for mosquitoes besides causing flooding during the monsoon. Since plastic does not undergo bacterial decomposition, land filling using plastic would mean preserving the poison forever. Any attempt to get rid of plastic through landfills is also dangerous. Apart from toxic seepage from the landfill resulting in the contamination of precious water sources, the waste mass impedes the flow of ground water. Landfills are also prone to leaks. The wastes, especially cadmium and lead in the wastes, invariably mix with rain water, then seep through the ground and drain into nearby streams and lakes and other water bodies. Thus the water we use gets poisoned.

There is an urgent need that the central Government of India should manage to get a legislation passed for the control of plastic pollution. Government should pass the 'plastic pollution control Act' to meet special India condition. Apart from such kind of Central legislation, there should be a city noise control code for all major cities in India. Tomorrow's leaders need to be equipped for tomorrow's challenges, and we must adequately prepare our children for the future they will inherit. That requires a commitment to providing children with environmental education that helps them become the educated thought leaders of tomorrow.

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