

Awareness and Attitudes of College Students Toward Plastic Pollution in Bangladesh: A Social Science Perspective on Environmental Education

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ABSTRACT

Plastic pollution poses a critical environmental challenge globally, particularly in developing countries like Bangladesh where rapid urbanization and inadequate waste management systems have intensified the problem. Despite growing global awareness, limited empirical research exists on how young people, especially students, perceive and understand plastic pollution. This study investigates the awareness levels of Higher Secondary Certificate (HSC) students in a Bangladeshi government college. Using a quantitative survey approach, 300 students from Humanities, Business, and Science disciplines were assessed to determine their knowledge, attitudes, and behavioral intentions concerning plastic pollution. The study also explores variations in awareness based on academic discipline, gender, and parental education. Results reveal significant differences across disciplines, with Science students showing higher awareness levels than their Humanities and Business counterparts. Gender and parental education also influenced students' knowledge and attitudes. The findings underscore the urgent need for a more integrated and inclusive environmental education framework across secondary education curricula. This research provides evidence-based insights for policymakers, curriculum developers, and educators aiming to strengthen environmental literacy and foster sustainable behavior among youth.

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1. Introduction

Plastic pollution is the buildup of plastics in the environment to the point where it poses a threat to human health and life as well as to wildlife and their habitats.¹ In the age of science, we completely rely on technology. By applying technology tools, humans are attempting to manipulate the order of nature and its ecosystem. These actions bear consequences and threaten the mere existence of civilization. The invention of plastic is an example. It turned into a part and parcel of daily living. Plastic is used almost everywhere: to preserve, deliver and carry foods and goods, in packing materials, in water supply facilities: containers, and tanks, plastic is replacing metals in electric equipment, vehicles, clothes, and safety equipment, in medical applications, and many more fields. Worldwide, plastic production has risen exponentially, with over 367 million metric tons produced annually as of 2020, and an alarming portion ending up in landfills, rivers, and oceans (Geyer et al., 2017; Iroegbu et al., 2021). As plastics degrade into microplastics, they infiltrate air, soil, and water systems, threatening biodiversity, public health, and environmental sustainability (Rubio et al., 2020).

The dependence on it makes us unaware of its dark side. It drastically pollutes nature and direly impacts human and animal health. This issue is particularly acute in developing nations like Bangladesh, a densely populated deltaic country crisscrossed by hundreds of rivers. These very waterways, which are vital for transportation, irrigation, and fisheries, are now increasingly choked with plastic waste, exacerbating flooding during monsoons and leaching microplastics into the ecosystem and food chain. Chemicals² leaching from plastic into the environment have been linked to various health issues, including asthma (Donohue et al., 2013), breast cancer (Acevedo et al., 2013), prostate cancer (Prins et al., 2007), impaired the growth of the nervous system (Alabi et al., 2019), hyperactivity, anxiety, and depression among children (Harley et al., 2013), diabetes (Sabanayagam et al., 2013). Plastic pollutants may alter liver and kidney function, blood pressure, adverse reproduction, and development (Rowdhwil & Chen, 2018). Plastic, a non-biodegradable material, accumulation in the environment adversely affects wildlife and animals and is detrimental to marine animals.

Observing the above short narrative, it is necessary to be aware of the impact of plastic pollution on the environment. If our generation next is aware of the hazard, there will be potential that plastic will not overwhelm future generations. The research under the study will attempt to know the level of awareness of the health risk of plastic pollution in a Government college in Bangladesh.

1.1 Background of the Study

Plastic an inexpensive yet durable material is used in everyday life. We are facilitated by plastic in all aspects of life including food, clothes, healthcare, transport, and the telecommunication industry (Andrady & Neal, 2009). By 2015 world annual plastic production might surpass 300 million tons emitting millions of tons of carbon oxides causing health risks for the people (Chen & Patel, 2012; North & Halden, 2013). Due to pollution mismanagement, Bangladesh is one of the topmost plastic pollutants in the world. According to a world bank report, on average

¹ <https://www.britannica.com/science/plastic-pollution>

² For public health issues, two main group of chemicals are of critical concern. They are bisphenol-A (BPA), and phthalates.

646 tons of plastic waste are disposed of each day of which only 37.2 percent is recycled³. With the growing economy, per capita, plastic consumption increased to 3.5 kg in 2014 and her consumption was 8 percent of the world average (Hossain et al., 2021a). As plastic is decomposed slowly, consumed overwhelmed, and in Bangladesh like in other parts of the world it is widely mismanaged, is seen as ubiquitous in air, soil, and waterbodies, and is causing massive pollution to all parts of the environment (Hossain et al., 2021a).

Recognizing this crisis early on, the Government of Bangladesh took a pioneering step by imposing a ban on thin plastic bags in 2002. While initially showing promise, the ban's effectiveness was hampered by a lack of stringent enforcement, the absence of readily available affordable alternatives, and strong lobbying from industry stakeholders. Consequently, plastic production and consumption have continued to rise virtually unabated. This policy implementation gap highlights a critical need for a multi-faceted approach that includes not only regulation but also public awareness and education. Within this context, the national curriculum in Bangladesh introduces environmental concepts primarily through general science and geography courses. However, the integration of specific, pressing issues like plastic pollution is often limited and not standardized across all educational disciplines. This study, therefore, seeks to investigate the awareness levels among college students, who are at a formative stage in their lives, to understand the effectiveness of current educational exposure and to identify gaps that need to be addressed to build a more environmentally conscious citizenry.

1.2 Problem Statement

Education on the environment empowers students with knowledge on issues of possible threats. Students with environmental awareness, are the potential agent of change which in turn would enable students with a greater voice on environmental degradation (Erhabor & Don, 2016). Plastic pollution, a global phenomenon, among other environmental threats, is a persistent challenge in today's world with immediate and long-term consequences (Iroegbu et al., 2021). With 168 million inhabitants, Bangladesh has a developing economy that contributes to a considerable volume of plastic garbage that poses a serious concern to the environment. (Hossain et al., 2021a). To mitigate pollution derived from plastic, Bangladesh as a pioneer of the world, imposed a ban on single plastics in 2002 (Proshad et al., 2018) and an exemption in tax if recycled (Hossain et al., 2021a). The intervention has seen little improvement as in the year 2014 alone over 90 percent of plastic waste has been disposed of in nature⁴. In Bangladesh, there has been minimal effort put into determining the level of public knowledge of improper plastic waste disposal, its effects on the environment, and its effects on public health. Therefore, the current research will attempt to assess college students' awareness and their attitude inclined to plastic pollution.

1.3 The Reason of the Study

Increasing knowledge and building awareness of environmental predicaments are presumed to change the attitude toward attitude to environmental behaviors and in turn assumed to minimize human impractical practices toward nature (Kollmuss & Agyeman, 2002a). Awareness of the environment is not meant to be informative about the environment, in broad terms it implies

³ <https://www.worldbank.org/en/news/feature/2021/12/23/meeting> Bangladesh's plastic challenge through a multisectoral approach.

⁴ <https://cpd.org.bd/plastic> waste management in search of an effective operational framework/.

causes, contributions, effects, and aftermath or impacts on nature (Hammami et al., 2017). Students are not influential in policymaking but their behavior toward plastic pollution can influence the community they belong to. In this aspect, education or knowledge could be a tool that should be utilized to fight against social ignorance against threats committed to plastic disposal. It can be sensed that the students today, are the policy maker of tomorrow, and comprises the crucial group to fight against plastic pollution (Hammami et al., 2017). By raising awareness of the students, the future of the country can be raised awareness of the people of the neighborhood about this growing issue (Kong et al., 2014).

1.4 Research Objective

The study seeks to:

- Determine the awareness and attitudes of students from Humanities, Business, and Science disciplines toward plastic pollution.
- Compare awareness levels among students across these three disciplines.
- Assess gender-based differences in awareness of plastic pollution.

1.5 Research Questions

The study addresses the following questions:

1. What is the level of awareness among Humanities students regarding plastic pollution?
2. What is the level of awareness among Business students regarding plastic pollution?
3. What is the level of awareness among Science students regarding plastic pollution?
4. Are there statistically significant differences in awareness across the three disciplines?
5. Is there statistically significant gender-based differences in awareness of plastic pollution?

1.6 Significance of the Study

While visible plastic debris in the environment is the most apparent form of pollution, this research takes a step back to examine the relationship between plastic use and awareness of its impacts. By focusing on young learners, the study aims to provide insights into their knowledge, attitudes, and behaviors regarding plastic pollution. These findings can inform educators, policymakers, and community leaders in developing targeted environmental education strategies.

Ultimately, this research seeks to contribute to the growing body of literature on environmental awareness among youth, particularly in developing contexts, and to support the design of interventions that promote sustainable practices and reduce plastic pollution before it escalates further.

2. Literature Review

Attitude. A persistent either positive or negative feeling concerning an issue, physical object, or person. Attitudes and beliefs are closely related. Beliefs are an individual's knowledge or opinions about another person, a topic, or an item. (Newhouse, 1990). Attitude, in the theories, has two parts. The emotional component and the cognitive component. Emotion involves feelings, and cognitive position indicates facts and beliefs. Hatzios (1996) stated that attitude is learned by being in direct contact with the object or by gaining information about it. In

contrast, Standen (2012) cited Rosenberg and Hovland's three-components⁵ model of attitude. There it is shown that the behavioral element has a high correlation with the affective and the cognitive element. On the other hand, Ismail et al. (2011) have found that attitude has an association with behavioral intention where intention leads to concrete behavior.

Students' attitude. According to Black (2006), a person's views about any object have an impact on their attitudes toward that object. On the other hand, Ismail et al. (2011) cited Fishbein and Ajzen's Theory of Respond Action (TRA)⁶ attitude of students can change the environment in either positive or negative direction, through subjective norms⁷(Ham et al., 2015).

Environmental awareness and attitude. Unexpected to presume, according to Diekmann & Preisendörfer, (1992) attitude has small or no pro-environmental conduct. This discrepancy they described using the cost model. Low-cost pro-environmental behavior, according to them has a significant relationship to environmental attitude. Gigliotti, (1992, 1994) examined college students' propensity for environmentally friendly conduct and discovered that those who believed in technical solutions were less receptive to making lifestyle adjustments. These assumptions are also can be found confirmed by Grob (1991). Thote (2013a) depicts an environmental attitude as a developed propensity to react consistently to a specific thing, whether it is favorable or bad. Environmental behavior influences what measures are taken to preserve and conserve the environment, increasing knowledge of environmental issues. More recent frameworks, such as the Value-Belief-Norm theory, further elaborate on these concepts, suggesting that personal values and beliefs about adverse consequences trigger personal norms that ultimately lead to pro-environmental behavior (Stern et al., 1999; van Riper et al., 2022). This is particularly relevant for understanding the motivations of youth.

Environmental awareness. Kollmuss & Agyeman (2002b) described environmental awareness as understanding the significance of how humans behave about the environment. They claim that it contains two components: a cognitive one that is knowledge-based, and an emotive one that is perception-based. On the contrary, according to Fietkau & Kessel (1981), environmental knowledge and pro-environmental conduct are directly related. Recent studies in developing contexts continue to explore this link. For instance, research in India by Chakraborty et al. (2021) found a positive correlation between environmental knowledge and responsible environmental behavior among university students, though a significant knowledge-behavior gap remained, echoing global challenges.

Plastic. The first synthetic plastic was created by Alexander Parkes, who exhibited it formally at the International Exhibition in England in 1862. Parkesine was a cellulose-based organic chemical that could be molded when heated and maintained its shape when cooled. But in 1907, Leo Hendrik Baekeland developed the first entirely synthetic resin that was commercially viable, known as Bakelite, which enhanced phenol-formaldehyde reaction methods (Bellis, 2013). Plastics can be classified in many ways. Gilbert (2017) divided it into three groups: Commodity plastics are a high volume, reasonably affordable range of materials. extensively used in building, construction, and packaging, particularly for beverage bottles. The second category is engineering plastics, which are compared more too expensive with

⁵ The ABC model: Affective, Behavioral and Cognitive

⁶ TRA aims to describe the association between attitudes and behaviors contained by human action. It is mostly used to predict behavior based on people's current beliefs and future intentions. (https://en.wikipedia.org/wiki/Theory_of_reasoned_action)

⁷ The belief that a notable person or group will applaud and encourage a particular behavior is known as a subjective norm. Subjective norms are the perceived social pressure from others to act in a certain way and the desire to concur with other people's viewpoints.

lower use. The global consumption of this type of plastic is 600 times that specialty plastics. They are recognized as linear polyesters and polyamides. It is consumed at a rate of one-third that of common plastics. The engineering groups' plastics are expensive, low-consumption materials that work best at temperatures about 2000C.

Plastic in use. Gilber (2017) noted that plastics are ubiquitous, and has an impact on the corner of life, and almost impossible to think about all their practical application. However, an example of some of the applications of plastics is portrayed in the Figure 1:

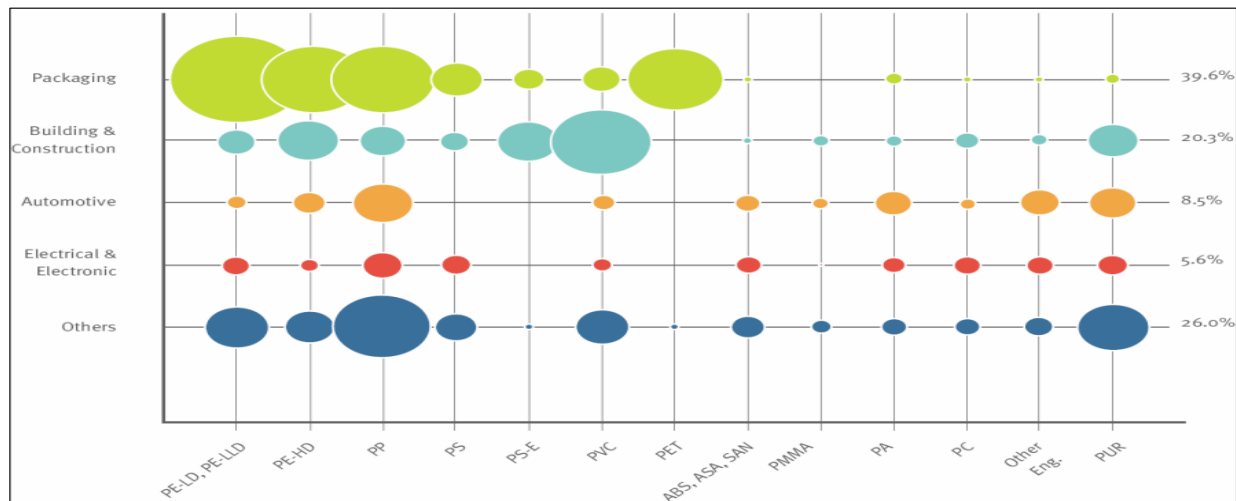


Figure: 1. Plastics demand by segment
Source: [PLASTICSEUROPE 2014]

Growth of Plastics. In 2012, there were 288 million tons of plastic produced worldwide. While usage of plastic has generally increased steadily, recent years have seen a slight slowdown in Europe. The worldwide economic downturn of 2008, as well as the 1973 and 1979 oil crises, all hampered growth. Before the 1970s oil crisis, the average annual growth rate for the plastics industry worldwide was 15%. After then, from 1974 to 2005, the annual rate was, on average, 8%. The predicted global consumption for 2015 was 365 million tons, and the prognosis for 2020 was 540 million tons, using a more cautious growth rate of 6.5% (Pardos, 2005). More recent data indicates that global production has continued to soar, exceeding 400 million metric tons annually pre-COVID-19 (OECD, 2022), underscoring the escalating scale of the challenge.

Health, Safety, Environment, and Plastic. Plastics have made a significant contribution to the development of human civilization, there is no denying it. But the spread of plastic waste (including macro, micro, and nano plastics) in the environment and its entrapment in biological systems have grown into significant problems (Fadare et al., 2020). Numerous emotive issues have been raised about the harmful consequences of chemicals found in plastics on human health, such as residual bisphenol A in items made of polycarbonate and phthalate plasticizers in flexible PVC (Gilbert, 2017). Plastic pollution has been linked to several diseases, including thyroid disorders, obesity, diabetes, and impaired reproduction (Forrest et al., 2019). For instance, it has been demonstrated that nano plastics hurt the diversity and composition of the microbiota in the human gut, which, considering recent studies showing a strong connection between the gut and brain's neural networks, may have negative effects on the endocrine, immune, and nervous systems (Teles et al., 2020). A comprehensive review by Senathirajah et al. (2021) consolidates evidence on the estimated human ingestion of microplastics and the potential health risks, highlighting it as a critical frontier in public health research.

Environmental dynamics are altered by plastic pollution, which has an impact on the natural properties of both living and nonliving constituents. Consequently, it makes sense to assume that the entrainment of nano plastics into the human stomach has physiological effects.

Micro- and nano plastics have been proven to be genotoxic to DNA. It has been shown that if the plastic material is small enough to pass through the nuclear membrane that protects the DNA, damage can occur, compromising the DNA's structure or causing lesions that, if left unattended or incorrectly repaired, can result in mutagenic processes that are thought to contribute to cell carcinogenesis. The shape, functional groups, and chemical makeup of the plastic debris were also discovered to have an impact on the type and severity of DNA damage (Rubio et al., 2020). Plastic fibers can be inhaled into the human airway, where their retention time is determined by their length, structure, and chemical composition. Additionally, all plastic fibers are likely to cause inflammation at certain exposure levels, which can cause lung problems such as the creation of reactive oxygen species, which can start malignant growth via secondary genotoxicity (Gasperi et al., 2018).

It has long been known that elements of plastic packaging interact chemically with or migrate into foods that contain fat; common interactions include antioxidants that migrate from plastic packaging into the food and occasionally attach to its surface (Vom Bruck et al., 1981). There may be a health concern if packaging additives are transferred from the packaging material to the food within. Furthermore, endocrine disruptors are produced by PET, a ubiquitous material used in the food and beverage sector (Sax, 2010). The plastic container allows these endocrine disruptors to seep into the consumables it holds. Phthalates, which may be endocrine disruptors, have been shown to leak from PET packaging into a variety of food products when there is water present (Sax, 2010).

Students' Awareness of Plastic Pollution. The main results of the study, which was carried out by Ferdous & Das (2014), demonstrated that eighth-grade pupils understand how to protect their land from the risks of plastic items. The study was titled "Attitude of Grade Eight Students toward the Use of Plastic in Gwarko, Balkumari, and Lalitpur Districts." At the practical level, the knowledge that is more precise, specific, and situation-based will be more appropriate to apply. In terms of gender, female students possess more specific knowledge and use it more frequently than their male classmates in practical settings. According to this survey, it would take some time for knowledge to translate into behavior. Knowledge may be lost over time because of switching kinds. The knowledge transfer loss varies depending on several factors, including the mode and instrument of transfer. From an educational standpoint, grade eight children may develop a favorable perception of the effects of plastic items because of the current educational system and curriculum design. Although not sufficient, the student's knowledge of attitude and behavior ratio is generally good.

Ghosh, (2014) researched the subject of "Environmental Awareness Among Secondary School Students of Golaghat District in the State of Assam and Their Attitude Toward Environmental Education." The primary findings were that, although attitudes toward environmental education were significant for students from both urban and rural locations, environmental awareness and attitudes among secondary school students of both genders were not the same. Students' views toward environmental education were found to have a strong and favorable association with their awareness of the environment.

A case study on students' attitudes toward environmental awareness was undertaken by Thote (2013). The study's findings suggested that the pupils are not performing well enough to address the issues of population growth, resource depletion, and environmental contamination. Students consequently lack the knowledge and abilities necessary to recognize issues and find

solutions. Environmental education achievement and environmental awareness skills did not significantly correlate positively.

Adeyemo (2012) researched the "Relationship between School Environment, Student Approaches to Learning and their Academic Achievement in Senior Secondary School Physics". The results show that there is a significant relationship between students' attitudes toward learning physics and their academic success in senior secondary physics, as well as a significant relationship between students' academic success in senior secondary physics and the physical environment of the school.

The "Knowledge on Consequences and Practices of Environmental Pollution of Secondary Level Students in Bangladesh" study was carried out by Moyen, (2013). The findings indicated that students frequently misunderstand what constitutes environmental knowledge about pollution. However, they typically think logically and favorably about the impact of environmental knowledge and practices.

Recent regional studies provide a crucial updated context. A study in Pakistan by Ali et al. (2023) found moderate awareness of plastic pollution among university students, with discipline being a significant predictor, mirroring the focus of the current study. Similarly, work in Vietnam by Nguyen et al. (2021) highlighted that while awareness of plastic waste was high, actual recycling behaviors were low, pointing to a persistent attitude-behavior gap. In India, a nationwide survey by Dwivedi et al. (2022) emphasized the role of digital media as a growing source of environmental information for youth, a factor becoming increasingly relevant in the Bangladeshi context. These studies collectively affirm the regional significance of investigating awareness and its determinants, while also suggesting that high awareness does not automatically translate to sustainable action, a key point for the discussion of this paper's findings.

3. Methodology

Research methodology, according to Kothari (2004), is a strategy for methodically addressing research problems and serves as an art for understanding how to conduct research scientifically. The basic guidelines for acquiring, processing, and organizing data for use in figures, surveys, and measured studies, as well as recording evidence, identifying it, and understanding it, are provided, he continued.

3.1 Research Design

The goal of a research design is to provide relevance to the study objective through a low-cost process of systematic data collection and analysis (Kothari, 2004). It is additionally referred to as the guide for gathering, evaluating, and interpreting study findings (Kothari, 2004). To learn students' attitudes and awareness regarding plastic pollution, this research used a quantitative research approach. Researchers, in research design, typically employ a variety of techniques when conducting research, including structured instruments, observation, interviewing, and record-keeping (Kothari, 2004). The design helps to explain the characteristics, viewpoints, perceptions, and behaviors of the sample population (McNabb, 2015). The study employed a random sampling design. The data analysis process had been laid out in advance. According to Stangor, (2014), it provides a detailed description of a certain event at one or more places.

3.2 Research Method

The two most common methods or approaches used in social science research are quantitative and qualitative. This study used a quantitative technique to get the desired conclusions since it used data from a representative sample of a Government College, a sub-district of Chittagong district in Bangladesh. According to Kothari (2004), the method collects information from a variety of sources and analyzes human behaviors by using computational, mathematical, and statistical tools. The author applied this methodology to learn how much the students are aware of plastic pollution. It aided in the study's quick data collection, cutting down on the amount of time needed for the research. The survey instrument was also used in this study's quantitative approach. The survey provides a thorough explanation of an event in a way that is extremely precise and realistic (Stangor, 2014). It both groups' variables into categories and looks for relationships between them (McNabb, 2015).

3.3 Research Context and Sampling

Students of three disciplines: Science, Humanities, and Business of the Government College at Chittagong in Bangladesh participated in the author's study on students' attitudes and awareness regarding plastic pollution: significance to environmental education. The sample population was chosen by the author using a simple random selection from students in Higher Secondary Certificate (HSC) classes at the college. All alternatives are distinct from one another, and each potential sample combination has an equal chance of being chosen. Simple random sampling is a type of probability sampling that ensures that every member of the population has an equal chance of being included in the sample. (Kothari, 2004). It assisted the author in maintaining validity and dependability while avoiding bias. *The study is based on data collected from students in three disciplines—Humanities, Business, and Science—at a government college in southern Bangladesh.* Data collection was conducted over a focused two-week period in November 2023 to ensure consistency and minimize external variables. The formula used to calculate the sample size is:

$$n = \frac{N \frac{z^2 p(1-p)}{e^2}}{\frac{z^2 p(1-p)}{e^2} + N - 1}$$

Where,

n= sample size

N= population size (=1200 students)

z = confidence level (in percent, such as 95%=0.95)

p= the sample proportion (in percent, 50%= 0.5)

e = margin of error (5%= 0.05)

For a population of 1200 students with a 95% confidence level the recommended sample size is 292. A total of 311 questionnaires were administered to ensure a robust sample size and account for potential incomplete or unusable responses. In all, 1200 HSC students were enrolled in all three disciplines. The sample consists of 90 (28.9 %) male students and 221 (71.1 %) female students (N=311). Data collected from the college is a female-dominated college. The male-female ratio represents this scenario.

3.4 Research Instruments

The study's questionnaire was the research instrument employed by the researcher. Common questionnaires were designed for the students of all three disciplines to ascertain the opinions of the three parties. There were structured, closed-ended questions on these forms. The most common method for gathering information from a sizable group for statistical analysis is to employ a structured questionnaire (McNabb, 2015). Section A, Section B, and Section C were the divisions made by the researcher in the survey. Demographic statistics are included in Section A, which includes six (6) questions. The basic knowledge status regarding plastic pollution was the subject of eleven (11) closed-ended questions in Section B. To find out the behavior of the students toward plastic pollution, Section C contained eight (8) questions with a Likert scale with a maximum of four points. This 4-point forced-choice Likert scale (eliminating a neutral midpoint) was intentionally selected to compel respondents to indicate either a positive or negative inclination, thereby avoiding neutral, non-committal responses and obtaining a clearer measure of their attitudes. The following are the Likert scale's dimensions:

Table 1. Likert Scale

Variable	Point
Strongly Agree (SA)	4
Agree (A)	3
Disagree (D)	2
Strongly Disagree (SD)	1

With Strongly agree weighted by 4 and Strongly disagree weighted by 1. In the Likert scale questions, students were forced to choose either agree or disagree by eliminating the neutrality option.

3.5 Methods of Data Analysis

After obtaining the information from the respondents, the author coded the data. To analyze the data, the study used descriptive statistics. According to McNabb (2009), this makes it easier to condense data from a big set to a smaller number of relevant figures that are understandable to readers. To examine the data graphically and narratively using data tables, this study calculated the mean, sum, and standard deviation for the demographic, knowledge question, and Likert scales of section C of the questionnaires. Charts and tables were created using the formula tools in Software Package for Social Science (SPSS) version 26. as well as Microsoft Excel 365.

3.6 Data Validity and Reliability

Face validity and construction were considered in the design of the instruments. The reliability coefficient was calculated in the study using Cronbach's alpha reliability statistics to verify the precision of Likert surveys with seven questions. (Tavakol & Dennick, 2011). For the questionnaire surveys for the students, the study discovered alpha coefficients of 0.78, (shown in Appendix). According to Tavakol & Dennick (2011). When assessing the dependability of an instrument, an alpha coefficient of 0.70 and greater is considered to be satisfactory, and one of 0.80 and above is preferred.

3.7 Pilot Study

To guarantee the validity and reliability of data collection, the study carried out a pilot survey. Before launching the final surveys, the researcher recruited 30 students, with 10 from each

field. The study discovered a Cronbach's alpha of 0.88, ensuring reliability, by examining the survey replies. The questions remained the same following the study.

3.8 Ethical Consideration and Consent

We were careful to ensure the security and confidentiality of the data that would be gathered before distributing the questionnaires and to accurately state the goals of the study. Students were not permitted to take part in the study if they did not complete the written consent form. The research investigator kept the permission forms and data in a secure location and maintained complete secrecy.

4. Findings and Discussion

According to research by Hossain et al. (2021b), In Bangladesh, a sizable amount of wasted plastic is being disposed of inappropriately, harming both the environment and public health. This paper discusses the level of awareness among students at a government college in Bangladesh. To assess students' awareness of plastic pollution and its implications for environmental education, survey data are analyzed and presented below.

4.1 Research Questions Revisited

The study was carried out to determine the responses to the following questions.

1. *What is the level of plastic pollution awareness among HSC students in the Humanities discipline?*
2. *What is the level of plastic pollution awareness among HSC Business students?*
3. *What is the level of plastic pollution awareness among HSC Science students?*
4. *Do students in the college's three fields have significantly different levels of awareness of plastic pollution, statistically speaking?*
5. *Is there a statistically significant difference between college students who are male and female in terms of their awareness of plastic pollution?*

4.2 Hypotheses

Null Hypotheses:

H_{0.1} Students in the college's three academic fields had similar levels of awareness of plastic waste.

H_{0.2} At the college, there is no discernible difference in the awareness of plastic pollution between male and female students.

4.3 Quantitative Findings

Individuals who met the inclusion criteria completed a total of 311 questionnaires. There were 99% of responses. The sample's demographics are all provided in the Table along with a summary.

Table 2. Demographic Frequencies of Sample

Variable	Category	Percentage
Gender	Male	28.9 % (n=90)
	Female	71.1 % (n=221)
Age	below 18	.3% (n=1)
	18-21	99% (n=308)
	21+	.6% (n=2)
Discipline	Humanities	36.3% (n=113)
	Business	32.5% (n=101)
	Science	31.2% (n=97)
Education Level	HSC	100% (n=311)
Mothers Education Level	Below HSC	58.2% (n=181)
	HSC	28.6% (n=89)
	Above HSC	12.9% (n=40)
Fathers Education Level	Below HSC	55% (n=171)
	HSC	23.2% (n=72)
	Above HSC	21.9% (n=68)

Table 2 displays those female students (71.1 % (n=221)) dominate male students (28.9 % (n=90)) in the number. Ninety-nine(n=308) percent of the interviewee students are within the age limit of eighteen to twenty-one. All three disciplines share an almost equal proportion in percentage where Humanities, Business, and Science belong for 36.3% (n=113), 32.5% (n=101), and 31.2% (n=97) each. A hundred percent of students (n=311) are Higher Secondary Certificate (HSC) students. In the case of parents' education below HSC is on top. For mother, the score is 58.2% (n=181) and for father this is 55% (n=171). The rest of the parent's education level is either HSC or above HSC with fathers' percentage of HSC and above education slightly ahead by 3 percent of that of mothers' percentage.

Table 3. Students' responses to the Knowledge questionnaire on plastic pollution

Question	Rightly Replied	Wrongly Replied
Do you believe that the ecology could be harmed by plastic waste? (Yes)	97.1%(n=302)	2.9% (n=9)
Do breathing difficulties result from plastic pollution? (Yes)	86.5% (n=269)	12.9% (n=40)
Does skin contamination from plastic cause issues? (Yes)	78.1% (n=243)	21.2% (n=66)
Does plastic pollution cause issues with reproduction? (Yes)	74. % (n=230)	25.4% (n=79)
Does plastic pollution hurt the brain? (No)	27.7% (n=84)	70.7% (n=224)
Does heart disease result from plastic pollution? (Yes)	76.5% (n=238)	22.8% (n=71)
Does the use of plastics cause cancer? (Yes)	80.7% (n=251)	19.3% (n=60)
Does plastic pollution cause issues with growth and maturation? (No)	23.8% (n=74)	75.2% (n=234)
What happens to the majority of plastic products in Bangladesh when they are thrown away? (Landfill)	47.3% (n=147)	49.9% (n=155)
What type of disposal is most environmentally friendly? (Recycling)	53.7% (n=167)	43.2% (n=135)
Do you believe that the trend of using plastic products is changing or staying the same? (Increasing)	80.1% (n=249)	18.4% (n=56)

In the case of basic knowledge, if plastic can harm the environment, all most all (97.1%(n=302)) agreed rightly that plastic waste can pose threat to the environment. The overall percentage was, however, just under 62.84% when awareness of various facets of pollution was added. [SD = ±23.11]. Students, independent of gender, are aware of the health risk of plastic pollution in the environment. 74 percent or over of the total students know that plastic pollution can cause threats to health for example problems in the lungs, skin, heart, and

reproductive system. However, while students were asked if they know plastic pollution might cause maturation problems or brain malfunction, in this case, 70 percent or over of the students answered incorrectly. 43.2% of the students failed to choose the right method for the environment to dispose of plastic waste.

Now, we attempt to test awareness if varies by dis by using One way ANOVA

Table 4. ANOVA for three disciplines

Discipline	Mean	SD	df	p-value	Comment
Humanities	6.96	1.729	2(Between Group) 308(within group)	0.001301	Significant
Business	7.18	1.486			
Science	7.77	1.313			

The ANOVA table, Table 4 displays that the mean difference among the disciplines is not by chance. P-value is less than 0.05. It indicates that mean difference exists. It refers to the higher mean score, in this case, is higher awareness of the plastic pollution. The table thus states that students of the science group have better knowledge regarding plastic pollution than students of other two disciplines. And between Business and Humanities, students of Business department have better understanding of plastic pollution.

We examine if awareness varies by male and female students using a t-test

Table 5. t-test score for males and females.

Gender	Mean Knowledge Score	SD	t-vale	p-value	Comment
Male	7.29	1.448	0.158681	0.874024	Not Significant
Female	7.26	1.604			

Table 4 attempts to find if there is any discernible difference in the awareness of plastic pollution between male and female students. Table 5 shows that the mean difference in male and female is by chance and Null hypothesis is not rejected. We can summarize that there is no significant awareness difference between male and female students at the College.

Now, we test students' awareness of parents' education parameters using One-way ANOVA

Table 6. Students' awareness of parents' education level

Parent	p-value	Significance
Mother	0.774416 > 0.05	Not significant
Father	0.563328 > 0.05	Not Significant

At the studied institution, Table 6 indicates that students' awareness of plastic pollution shows no significant correlation with parental education levels.

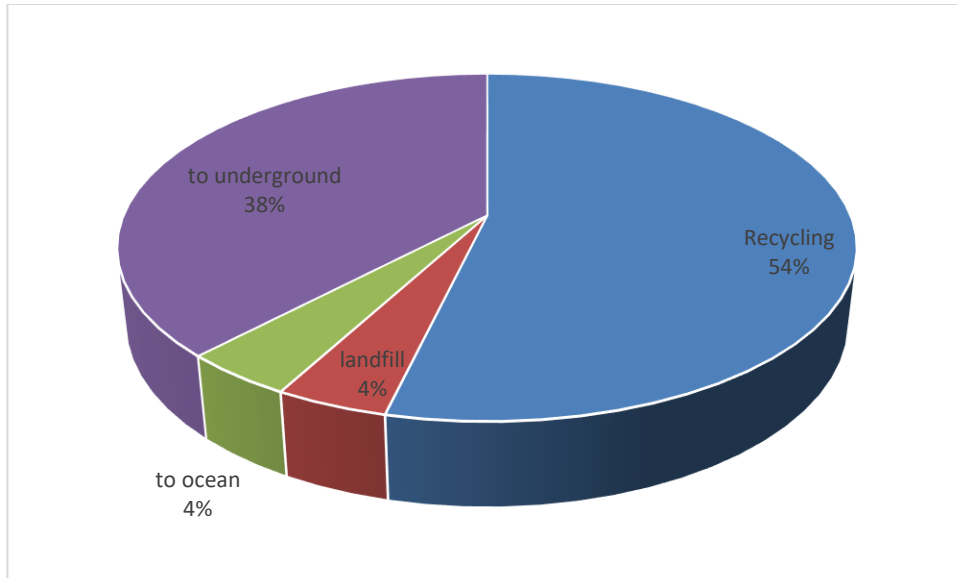


Figure 2. Student's response to the best disposal method for the environment.

54% of the students believed that plastic recycling is the best disposal method for environment. Whereas 38% voted to underground plastic waste.

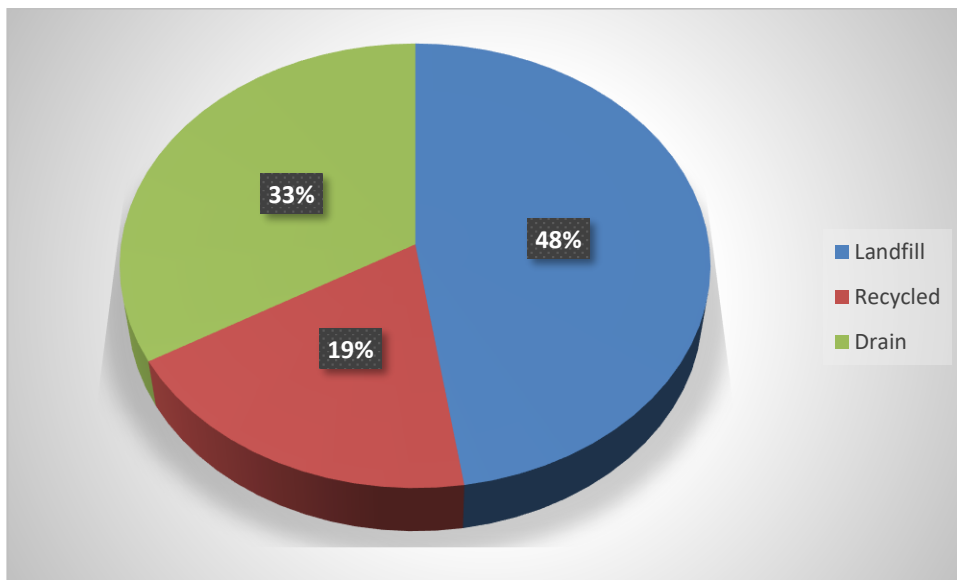


Figure 3. Students' response to the question in Bangladesh, what happens to most of the plastic products after being disposed of?

The Figure 3 tells what students are thinking of what happens to most of the plastic waste after being discarded. 48% says plastic goes to landfill whereas 33% believes they are recycled.

Attitude of the students toward plastic pollution:

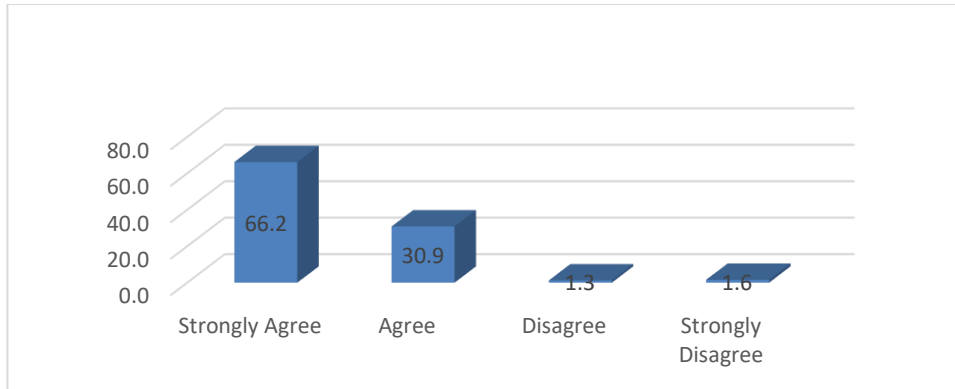


Figure 4. Students' willingness to spread awareness about plastic pollution.

Figure 4 shows more than 96% students are either strongly agree or agree to spread pollution awareness. In another question while they were asked if they would wait for government to come forward, 84% commented they would not wait for the government to spread awareness. Among them 40% agreed to spend their own money to take part in the campaign. 91% responded they will reuse plastic to tackle the pollution.

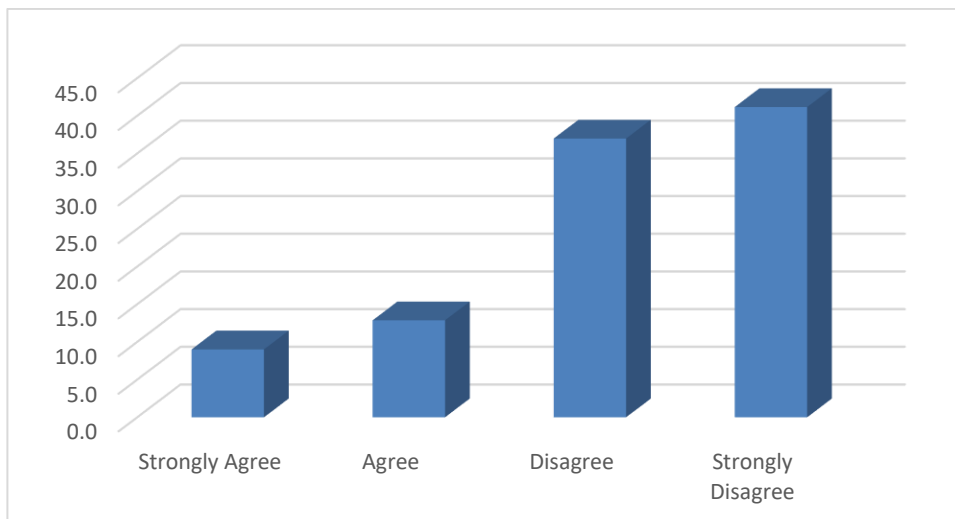


Figure 5. Unwillingness to know health risk

Figure 5 shows that 78 percent respondents answered negatively in question if they were unwilling to know the health risk of plastic pollution. 74% said they want to know the law regarding plastic pollution. 65%, in another question wanted to confirm the plastic bought is biodegradable. 60 percent responded that they would search for trash to discard plastic.

4.2 Quantitative Discussion

Plastic pollution awareness levels and how they affect students' views

Analysis of student responses revealed generally low baseline knowledge about pollution and the ecological impacts of plastic waste. The average score of students is substantially lower at 62% in comparison to secondary students in Malaysia (74.4%), (Aminrad et al., 2013), Singapore (70.9%) (Ivy et al., 1998), and Hungary (74%) (Stevens E, 2002), according to polls conducted elsewhere. These results highlight a knowledge gap among students and raise the issue of how much environmental education pupils are receiving inside the current education system. This disparity suggests that environmental education in Bangladesh may not be as

integrated or effective as in other nations, potentially due to curriculum differences or a greater focus on rote learning over applied environmental science.

Found gender disparities to be consistent with previous investigations (Kong et al., 2014). However, our findings revealed no statistically significant difference in awareness levels between male and female students (Table 5). This contrasts with some studies, such as Ferdous & Das (2014), who found female students possessed more specific knowledge. This divergence could be attributed to the high penetration of general environmental messaging through mass media and social platforms in Bangladesh, which may be effectively reaching all demographics equally and eroding traditional gender-based knowledge gaps. It suggests a homogenizing effect of digital media on environmental awareness among the youth, a phenomenon increasingly observed in developing contexts (Dwivedi et al., 2022).

Similarly, the study found no significant correlation between parental education levels and student awareness (Table 6). This was an unexpected result, as higher parental education is often linked to greater environmental awareness in children. A potential explanation is the widespread access to information via smartphones and the internet among youth, which may have decoupled knowledge acquisition from traditional family-based educational influence. Students may now be forming their awareness from a common, digital pool of information, making parental education a less distinct factor.

The most significant finding of this study is the clear, statistically significant difference in awareness levels across academic disciplines (Table 4), with Science students demonstrating the highest awareness, followed by Business and then Humanities students. This finding aligns with the study by Chakraborty et al. (2021) in India, suggesting that science curricula more frequently and directly integrate topics related to chemistry, public health, and environmental biology, which naturally encompass the causes and effects of plastic pollution. Business students, often exposed to concepts of corporate social responsibility and sustainability, may have moderate exposure. Humanities students, whose curricula may focus less on scientific applications, appear to have the least integration of these topics, leading to lower assessed knowledge. This underscores a critical gap in the current interdisciplinary approach to environmental education within the institution.

Another compelling result is the stark contrast between students' moderate knowledge (62%) and their overwhelmingly positive attitude and high willingness to act (96% agreed to spread awareness). This indicates a strong latent motivation among the youth that exists independently of deep knowledge. This attitude-behavior gap is well-documented in environmental literature (Kollmuss & Agyeman, 2002a). However, it also presents a crucial opportunity: this high willingness suggests that students are a receptive audience for intervention. Educational programs and campaigns can harness this positive attitude as a foundation, even before knowledge levels are maximized. The motivation to act is already present; it needs to be channeled with targeted knowledge and supported by accessible infrastructure.

Increasing people's knowledge of such a ubiquitous issue is a crucial first step in altering people's behavior since it had an impact on the participants' perspectives and motivation to start a change. Similar outcomes were discovered in studies in Texas. (Bradley et al., 1999), Malaysia (Aminrad et al., 2013), and Istanbul (Ergen et al., 2015). Even though they believed the municipality to be the primary party responsible for limiting this spreading of pollution, participants with greater awareness expressed a significantly larger desire to participate and create a change, either by engaging themselves or by encouraging others to become more aware. To give the people a chance to change this thinking into good behavior, the state still must provide improved recycling facilities, more advertisements, and strict restrictions to ban the transgressions of many enterprises and businesses.

5. Conclusion and Recommendations

Introduction

Environmental education is a process of accepted values and explanations designed to help people learn how to interact with their environment and participate in it. It develops a broader perspective that recognizes the interdependence of the natural and built environments. It ought to be an ongoing process that begins in preschool and lasts throughout all stages of life., considering the environment. It must be interdisciplinary and consider important environmental issues from a regional, state, and international standpoint. It should employ a variety of teaching techniques with an emphasis on experiential learning and hands-on activities to educate about and learn from the environment. Through this educational process, society's citizens can become knowledgeable about environmental protection and develop problem-solving skills, enabling them to take part in initiatives done to save the environment (Thote, 2013b).

Plastics are widely used around the world in many aspects of everyday life and have aided civilization's development in several ways. They are noted for being affordable yet durable materials. They have benefited various industries, including those involved with food, textiles, transportation, telecommunication, and healthcare (Andrady & Neal, 2009). The world may have created more than 300 million metric tons of plastic per year by 2015, claim North & Halden (2013). Since the 1800s, when the industrial revolution began, plastic pollution has been a worldwide problem. This study evaluates knowledge, awareness, and attitudes regarding plastic pollution among college students in southern Bangladesh. A cross-sectional survey was conducted with 300 students from Humanities, Business, and Science disciplines at a government college, using stratified random sampling. Self-administered questionnaires were distributed during the study period.

5.1 Review of the Findings

Discipline, gender, and the educational level of the parents were some of the variables that affected the levels of awareness of plastic pollution and its effects. The enforcement and execution of pro-environmental initiatives require a suitable environment. One of the many actions that may be performed to create the perfect atmosphere is to include more interactive lectures and activities about this issue in the educational system and to promote its continuation throughout schooling. Active learning should begin in primary and elementary schools rather than being restricted to the classroom. Public and private industries should be encouraged to incorporate this kind of instruction into other extracurricular educational resources like social media and online gaming. A better recycling environment and strict restrictions should be provided by the state as well to lessen this ongoing issue.

5.2 Implications for Practice

The study will offer details and an understanding of the concerns raised by college students regarding plastic contamination. The report will also provide a foundation for actions by the public and private sectors, government planners, and politicians to assist lessen the severity of this growing threat. The main objectives of this study are to stimulate more research on Bangladesh's plastic pollution as well as to raise awareness among relevant authorities of the need for legislation and enforcement of required measures to combat pollution problems before it is too late.

The findings of this study have direct and significant practical implications for multiple stakeholders in Bangladesh:

- **For Curriculum Developers and Educators:** The significant disparity in awareness between science and non-science students highlights a critical gap in the national curriculum. This study provides empirical evidence to advocate for the **mandatory integration of environmental education, with a specific module on plastic pollution, across all academic disciplines** at the HSC level, not just the sciences. Pedagogy should move beyond theory to include practical, hands-on activities like waste audits or community awareness projects to bridge the identified attitude-behavior gap.
- **For Policymakers and Government Agencies:** The students' high willingness to act, coupled with their misconceptions about recycling (e.g., believing most plastic is recycled when it is landfilled), indicates a public ready to support stronger environmental policies. However, awareness alone is insufficient. Policymakers must use these findings to **develop and enforce robust extended producer responsibility (EPR) schemes, invest in visible and accessible waste management infrastructure**, and launch public information campaigns that correct misconceptions and provide clear guidance on proper disposal and reduction.
- **For University Administrators and Community Leaders:** The findings justify the immediate implementation of **on-campus plastic reduction initiatives**, such as banning single-use plastics in cafeterias, installing water refill stations, and establishing easy-to-use recycling bins. Furthermore, students represent a potent force for community outreach. Universities can **create certificate programs or "green ambassador" clubs** to channel students' motivation into organized community awareness and clean-up drives, thereby amplifying the impact beyond the campus walls.

In conclusion, this research moves beyond merely diagnosing an awareness problem; it provides a blueprint for actionable change by identifying key levers—curricular reform, targeted policy, and student-led activism—that can be activated to foster a more environmentally literate generation and mitigate the plastic pollution crisis in Bangladesh.

5.3 Limitation of the Study

Due to practical constraints, this study was limited to a single government college in southern Bangladesh, which may affect the generalizability of findings to the national population. Additionally, while the survey captured key attitudes and behaviors, more in-depth qualitative data could have provided richer insights into student perspectives.

5.4 Recommendations for Future Research

Plastics are blamed for the catastrophic contamination of the atmosphere, soil, and water supplies because they are becoming more and more ingrained in every component of the environment. There hasn't been much effort made in Bangladesh to quantify the amount of plastic trash and its impacts, which is necessary in order to appropriately manage this expanding problem. Secondly, very little literature can be found on Bangladesh's perspective which relates to education and environmental awareness. Thirdly, rigorous research attempt is yet to be taken to which would promote the urgency of students' attitude toward plastic pollution and public health.

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Appendices

Appendix A

Surveying college students' attitudes and awareness regarding plastic pollution. General Information Sheet

You are invited to take part in a research study. This research study is part of a Module I am taking at the School of Education. Before you agree to take part, it is important to understand why the research is being done and what it will involve.

Please take time to carefully read the following information. Please ask me if there is anything that is not clear, or if you would like more information. Please think about it carefully and then decide whether you would like to take part or not.

What are the aims of the research?

This study aims to know the level of awareness, attitudes, and behaviors regarding plastic pollution of college students in Sarzana. We will look at responses to the knowledge questions about different aspects of plastic pollution the students.

Who else is and can be involved?

Besides you, students from three disciplines (namely Humanities, Business, and Science) of the college will be invited to participate.

What sorts of methods are being used?

This research is based on data collected via a questionnaire.

Why have you been chosen?

You have been invited to participate in this study because you are a student of the college we intend to conduct the study.

What are you being asked to do?

You are being asked to complete a questionnaire and give permission for the researchers to use your responses on the questionnaire.

Will my taking part in this study be kept confidential?

The data we collect will be treated confidentially, and only members of the research team will have access to the raw data. All information collected while carrying out the study will be stored on a database that is password protected and strictly confidential. The digital and textual data will be kept in a secure and confidential location. Your name will not appear on any database or any information which is then published. Instead, a number will be used as an identifier on all data associated with you. The master copy of the names associated with each number will be kept in a separate, secure, and confidential location.

We will report the results anonymously. When results are reported all individuals and institutions (e.g., individual schools and zones) will be anonymized, so neither you nor your affiliations will be identifiable.

We are committed to carrying out our research according to the ethical guidelines provided by the British Educational Research Association (online at <http://tinyurl.com/6r5juzm>).

What will happen to the results of the research study?

We expect to talk about our research at professional conferences and write about it in academic journals.

Do you have to take part?

Your participation is entirely voluntary. It is important you understand that you do not have to participate in the project at all, and even if you decide to take part you are still free to stop at any time and without giving a reason.

What are the possible disadvantages of taking part?

We realize that some people may find completing the questionnaire tiring or difficult and we understand that for some students this may cause feelings of discomfort or anxiety. Otherwise, we do not believe there are any risks or disadvantages to you in taking part.

What are the possible benefits to me of taking part?

We hope that your views, and those of others, will help us better understand to know level of awareness, attitudes, and behaviors regarding plastic pollution of college students in Satkania.

Who is paying for this research and who is carrying it out?

The research is being carried out by myself. I am a student at the University of Nottingham, School of Education. I am being supervised by Dr. RICHARD PETER BAILEY. If you have any questions or concerns about the research, you can contact me or my supervisor:



If you agree to take part in this study, please:

1. Keep this copy of the Information Sheet for your records
2. Sign the attached Consent Form
3. Fill-in the attached questionnaire

Appendix B

Surveying college students' attitude and awareness regarding plastic pollution.
Consent Form



1. I have read the Information Sheet.
2. I understand the nature and purpose of this research.
3. I have received enough information to make an informed decision about taking part.
4. I understand that I can raise questions, offer criticisms and make suggestions about the project.
5. I understand that I can decide *not* to participate in this project at any time after agreeing to.
6. I agree to contribute to this research.
7. I agree for the interview to be audio-taped.
8. I agree for my responses to be analyzed for this research.

I consent to take part in this project after considering the information provided.

NAME (capital letter):

Signature:

Date:

Appendix C

Surveying college students' attitudes and awareness regarding plastic pollution
Questionnaire

Dear Participant,

Thank you for taking the time to fill in this questionnaire and agreeing to be part of this research study. This questionnaire consists of 3 sections. Section One asks you for information about yourself and Section Two asks you to respond to questions regarding basic Knowledge of plastic pollution. And Section- three asks to know your attitude toward plastic pollution. There are THREE pages in total. It should take about 10-15 minutes to complete this questionnaire.

Section-A (Personal info)

1. What is your Gender?
a) Male b) Female
2. What is your age?
a) below 18 b) 18 -21 c) above 21
3. What is your department?
a) Humanities b) Business c) Science
4. Education Level
a) HSC b) Degree (Pass) c) Honors
5. Mother's educational level
a) below HSC b) HSC c) above HSC
6. Father's educational level
a) below HSC b) HSC c) above HSC

Section-B (Basic Knowledge on Plastic Pollution)

7. Do you think plastic waste can harm the environment?
a) Yes b) No
8. Does plastic pollution lead to lung problems?
a) Yes b) No
9. Does plastic pollution lead to skin problems?
a) Yes b) No
10. Does plastic pollution lead to reproductive problems?
a) Yes b) No
11. Does plastic pollution lead to negative effects on brain functions?
a) Yes b) No
12. Does plastic pollution lead to heart problems?
a) Yes b) No
13. Does plastic pollution lead to cancers?
a) Yes b) No
14. Does plastic pollution lead to growth and maturation problems?
a) Yes b) No
15. In Bangladesh, what happens to most of the plastic products after being disposed of?
a) Landfill b) Recycled c) Disposed in the Canal d) Disposed in the drain
16. What is the best disposal method for the environment?
a) Recycling them b) Disposing to landfill c) Dispose to ocean d) Dispose to underground
17. Do you think that the trend of utilization of plastic products is increasing or decreasing?
a) Increasing b) Decreasing c) Neither is true d) Anything Possible

Section- C (Attitude toward plastic pollution)

18. I am willing to spread awareness about plastic pollution to friends and family members.
a) Strongly agree b) Agree c) Disagree d) Strongly Disagree
19. I am willing to reuse and bring my own bags for shopping.
a) Strongly agree b) Agree c) Disagree d) Strongly Disagree
20. I am willing to support environmental campaigns by paying money.
a) Strongly agree b) Agree c) Disagree d) Strongly Disagree
21. I am willing to start a campaign with my friends and not rely on the government.
a) Strongly agree b) Agree c) Disagree d) Strongly Disagree
22. I am unwilling to throw used plastic into a dustbin.
a) Strongly agree b) Agree c) Disagree d) Strongly Disagree
23. I am unwilling to make sure the plastic I am using is biodegradable.
a) Strongly agree b) Agree c) Disagree d) Strongly Disagree
24. I am unwilling to know the laws and punishments for plastic pollution in Bangladesh.
a) Strongly agree b) Agree c) Disagree d) Strongly Disagree
25. I am unwilling to know the health risk being caused by plastic pollution.
a) Strongly agree b) Agree c) Disagree d) Strongly Disagree

Appendix. D

Reliability

Scale: alpha

Case Processing Summary

	N	%
Case	30	100.0
Excluded ^a	0	.0
Total	30	100.0

a. Listwise deletion based on all variables in the procedure.

Reliability Statistics

Cronbach's Alpha	Cronbach's Alpha Based on Standardized Items	N of Items
.786	.788	3

Item Statistics

	Mean	Std. Deviation	N
23. I am unwilling to make sure the plastic I am using are biodegradable.	3.10	.960	30
24. I am unwilling to know laws and punishment about electric pollution in	3.30	.915	30