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Our Environment: A World Away?

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Introduction

When asked about environmental concerns, I would venture that my fourth grade gifted students' response would be centered on endangered animals, global warming, and pollution. They would not think about their own health or their immediate environment as it seems so nice. Why? Well, they live in a nice part of town where landscapers keep the green space groomed, their families don't smoke, and the garbage man picks up all of their trash and takes it away. We have a recycling program at our school and we dutifully recycle our plastic bottles, aluminum, and paper. In their minds, our impact on the environment is nominal. But, what happens to our trash?

Rationale

I teach gifted fourth grade students in an affluent neighborhood at an International Baccalaureate World School (IB). The goal in an IB school is to promote global thinking and action. We are always looking for the action students can take based on their learning.

My students are extremely motivated and very interested in the world around them as most fourth graders are. Our school is unique in that almost fifty percent of the population is identified as gifted and I have an average of seventy students per year. I see all seventy fourth grade students each day for about an hour (six classes per day of twelve to fifteen students). In order to best serve these students without too much disruption to the classroom teacher's schedule I am responsible for their reading instruction and grade. I provide instruction in all subjects by delivering the state standards with an emphasis on problem solving, creative thinking, research, and each student's unique contribution to society.

The social emotional realm (affective domain) is important in gifted education as many of these students don't relate to typical kids their age - so many times they feel "different". They feel deeply about the world around them and tend to be quite compassionate and knowledgeable about current events. They pick up on adult conversation and comprehend "grown-ups" better than typical kids their age. I am not saying that typical kids

don't have this ability just not usually to the same degree. This can lead to depression and anxiety. I want my students to have an outlet to express their feelings. They can do something about what they see going on in the world. They have a voice and they can make a difference.

Since, I am particularly passionate about environmental issues and futures studies I tend to delve into these areas with my students. Fortunately, the state standards for fourth grade fit nicely with my interests. Reading comprehension, vocabulary, research skills, and writing are among the reading standards. Ecosystems and human impact on the environment are part of our science standards. This allows for an in depth study of our environment when coupled with the gifted standards (problem solving, creative thinking, research, and each student's unique contribution to society).

The students have the luxury of travel, access to the Internet, books, and highly educated families. However, they are still quite sheltered as many nine to ten year olds tend to be therefore, many aspects of life go unnoticed such as: what happens to their trash. So, when I expose them to the issue of waste they will be moved to action as they will be quite concerned when they start to think about it and study the issue especially when they realize they are contributing to the problem.

Unfortunately, their trash ends up in landfills on the other side of town never to be heard from again by them. However, the residents of the other side of town have to live with the trash that has ended up in the 5 major (now closed) landfills and waste transfer stations in their backyards. My students' neighborhoods do not have any landfills or waste transfer stations nor would they ever stand for one. The land is too expensive and not zoned for waste disposal as well as the considerable financial and legal ability on the part of the residents to fight.

I am interested in my students' awareness of their effect on the environment, particularly our local environment. Since their trash has ended up in the now closed landfills I wonder how they would feel if our cities' trash ended up in their backyard? This will never happen therefore, is it okay that their trash ends up in someone else's backyard? If not, then what can/should be done to minimize the impact?

Since my students do recycle paper, plastic bottles and aluminum what are we throwing away? I tend to look in my trashcans each day wondering where it will all go and is there anything that could be recycled that was accidentally thrown away. The majority of it seems to be food wrappers.

The children come to school each day with a snack. They bring everything from health bars to store bought sliced apples in individually wrapped packages (which were sold in a larger package). So, they are buying packages of packages for convenience. Many of these wrappers are some sort of plastic that is not of a recyclable grade. These wrappers fill my trashcan each day and I am sure every other classroom as well. What is the material that these food wrappers are made of? It seems to be plastic so, why can't we recycle it?

Objective

My approach to teaching and learning is that of a constructivist. The constructivist approach allows for the learner to build new meaning from hands-on real world experiences that build upon prior knowledge. This approach will be evident throughout the learning activities found in this unit. I am always looking for ways to facilitate student "discovery" as I believe that all children, not just my gifted students, learn best when they

construct meaning by doing. The shift is from the traditional teaching method of "telling" the students what I want them to know to wanting the students to show and tell *me* the meaning of the various learning activities. The question then becomes, "What do you think?" as opposed to the statement, "This is what I (the teacher) think." This does not mean that my opinion, thoughts, knowledge and objectives are unnecessary it is actually the opposite. I am looking for their ideas *first*, based on carefully designed activities derived from the learning objective and the state standards.

I hope to provide sufficient, concise background information using everyday analogies combined with factual information which will help the educator and then the student build meaning. The end outcome being action and application in everyday life based on empirical evidence and understanding.

Ultimately, with this unit I want the students to be more aware of what they are throwing away, how their trash is affecting the environment and their health, and to see an overall reduction in the amount of food wrappers. I will assess this by having the students collect data on the amount of food wrappers being thrown away in the fourth grade and to draw conclusions via researching and discovery lessons about the implications for the environment and human health. Next they will design a new recycling labeling system and create a campaign to encourage the use of reusable food containers (hopefully an easy to conclude solution). Finally, they will continue to collect and analyze data on food wrappers to see if there is indeed a reduction due to campaign efforts by asking the questions: Did I make a difference? How can I find out? If not, how could my campaign be more effective? If so, how can I get more people to make the switch to reusable packaging?

The realization that the food package waste in the classroom garbage can is mostly unrecyclable plastic helps to guide my unit. I will begin by summarizing plastics and their composition. Then, plastic's impact on the environment (landfills, ocean, animals), and the impact of the chemicals found in plastic on human health. Finally, I will explain the coding system for recycling plastics, and share some statistics on school food packaging waste. The end result being a concise body of knowledge for the educator to use in conjunction with constructivist learning activities designed for students to reduce their impact on the environment and human health.

Student Activity 1

Objective: Students will determine the types of plastics found in fourth grade trash.

Essential Question: What are we throwing away and how does it affect our environment?

Procedure:

1. Collect trash from fourth grade classrooms for a day.
2. Divide students into groups of 2 or 3 students and have them wear rubber gloves (for sorting the trash). They should determine sorting categories (type of material, unknown, recyclable). The idea is for them to notice that there is a lot of plastic.
3. Graph results. Students decide what type of graph they would like to create (bar, picture, line). They can count, measure, or weigh the trash.
4. Have the students determine analogies for the size/amount of trash that the fourth grade generated in one day. Analogies for a week or for the whole school could also be generated.

5. How will this impact the landfills in a year?
6. What are these plastic food wrappers made of?

Closure:

Students should come to the conclusion that we are adding an immense amount of plastic to our landfills. What happens to the plastic that we throw away?

Polymers and Plastics

The benefits of polymers and plastics have been so essential to manufacturing and the marketplace that the makers and the government didn't really address the possible negative side effects. Plastics keep our food fresh; reduce packaging weight, they are also durable and inexpensive to produce. Fresher food means longer lasting food therefore, less money can be spent on food. Packages that are lighter need less fuel to transport them to the marketplace. It is also durable so it can be used in products that are used over time such as: shampoo bottles, Tupperware, building materials, clothing, and car parts. Inexpensive production costs keep product prices down as well.

The U.S. plastics industry has $379 billion in annual sales and employs 850,000 people.[1] There are an estimated 21,000 companies manufacturing plastic products or plastics raw materials. Based on all of this information, pose the question (without telling them that you are referring to plastic), "What if I told you there was a product that could keep our food fresh, clothe us, reduce fuel costs, was durable, inexpensive, and versatile? What if this product generated $379 billion dollars for our economy and employed 850,000 people? Would you want to use it?" The polymer/plastics industry is huge and accounts for seventy percent of the synthetic chemical industry in the US.[2]

Students might brainstorm a list of polymers and plastics by looking around their homes, workplaces, stores, schools, cars, etc. to find things made of plastic such as: pencils, furniture, carpet, cars, packaging, clothes, cosmetics, baby products, lotions, scented candles, dryer sheets, and a vast array of many other items. They will probably not realize all of the things that are considered polymers or plastics. I imagine their lists will be more obvious items. Plastic is everywhere - where does it come from? How do plastics differ?

Polymers are found in nature and are composed of chains of hydrocarbons or monomers which come from natural gas, oil, coal, and plant materials. (It may be useful to discuss the prefixes poly- and mono-). Plastic is made from polymer however synthetic chemicals have been added therefore, all plastic can be considered polymers but polymers are not necessarily plastic. Polymers are natural and always used in the production of plastic but, plastic has additional synthetic chemicals so polymers are not necessarily plastic.

Create a display of polymers and plastics. Ask students to determine which items are polymers v. plastics. Items from nature that are polymers that could be displayed: hair, wool, fur, proteins, silk, tree sap, shellac, amber, and cellulose from trees. Yes, trees are actually used in the production of plastic. Synthetic polymers or plastics can be molded into almost anything (toys, bumpers, clothes, food packaging, bottles, diapers, carpet, furniture, etc.) when synthetic chemicals or plasticizers are added.

Plasticizers are chemical additives such as Di (2-ethylhexyl) phthalate or DEHP, and bisphenol-A or BPA that increase flexibility and make the plastics heat resistant. These chemicals are added to hard plastic like PVC (composed of salt and ethynol) and they act as a spacer between the molecules sometimes creating the "weaker" more flexible version. This concept can be demonstrated with the following analogy: pasta. Uncooked pasta is hard and not flexible (some more than others) but when you add water and heat it becomes pliable. This is a VERY simple analogy. However, imagine if the water and heat were foreign chemicals such as DEHP and BPA and we were unsure if they were safe.

Unfortunately, until recently, these chemicals were not thoroughly tested to determine their impact on our health or the environment. DEHP and BPA are common ingredients in plastics. Infants suck on bottles and toys, wear diapers, and we all consume food and beverages from plastic containers that are made from some of these chemicals. Are they safe?

Impact of Plastics on the Environment

What happens to plastics when we are done with them? The students will say that we throw them away or recycle them. Plastics that are thrown away end up in our landfills and most surprisingly the ocean. Students can be motivated or "hooked" into the issue by viewing a video of, "The Pacific Garbage Patch." [3]

Nine percent of the trash in landfills is plastic.[4] Polymers and plastics that degrade in a landfill release carbon dioxide and/or methane into the air.[5] Those that remain unchanged or that do not degrade take up precious space in our already overflowing landfills. The other pressing issue is leachate. Leachate is the liquid that leaches or drains into the ground from landfills.[6] Liquids that leak into the ground get into the groundwater which flows into rivers, lakes, and other bodies of water (see appendix for diagram). This liquid smells and is contaminated with many chemicals that poison our ecosystem.

The North Pacific subtropical gyre is a 10 million square mile oval located north of Hawaii that sailors avoid due to the clockwise swirl of currents that make passage difficult. It is also the home to an area of enough plastic debris to equal twice the size of Texas hence, the name, "The Pacific Garbage Patch". This is the largest landfill in the world.[7] It is estimated that ninety percent of the trash floating in the ocean is plastic.[8]

Plastic is not biodegradable but photodegradable: it breaks down into small bits when exposed to sun and water. In this area the ratio of plastic bits to plankton is six to one. So, you can imagine that a hungry animal could easily ingest a great deal of plastic. This plastic will block their digestive systems as well as possibly contaminate them, the water and air with the chemicals in plastic.

These tiny bits of plastic are called nurdles or mermaid tears [9] (ask the students why they think the term "mermaid tears" is used). Nurdles are preproduction plastic pellets, plastic resin, or bits from larger plastic pieces that have broken down. When plastics break down in the ocean, landfills or in food packaging the chemicals that were added in manufacturing are released into the water, air, food and products.

There are some staggering statistics on the amounts of plastics and plasticizers being produced in the U.S. In 2002, nearly two hundred and forty million pounds of DEHP was used in the production of fourteen and a half billion pounds of PVC (used for food packaging, house siding, water pipes, coating on electrical lines, and

mattress covers). Two point three billion pounds of BPA was produced in 2006. Human consumption of plastic may reach three hundred pounds per person by the year 2010.[10] Since only about five percent of plastics are recycled each year what is happening to the billions of pounds that are not recycled? The enormous amount of plastic being produced and discarded is cause for alarm.

BPA is one of the most common chemicals found in groundwater due to lack of recycling. When products are not recycled they end up in landfills which leach chemicals into the groundwater that eventually flows into rivers and streams.

DEHP is a phthalate added to PVC as a plasticizer (earlier I stated that plasticizers are added to hard plastics like PVC to give them flexibility). There are six phthalate plasticizers on the market however; DEHP is the most widely used. Unfortunately, the fifteen billion pounds of PVC produced each year are difficult to recycle due to the chemical make up. It ends being incinerated or in landfills and the DEHP is leached into the groundwater and air. DEHP is found in human fluids.[11]

Impact of Plastics on Health: DEHP and BPA

Ask students to recall how we interact with plastic: We eat foods that are wrapped in plastic, we drink water from plastic bottles, children play with plastic toys, babies drink from bottles, it's in our clothes and carpet and we eat fish from the ocean. Can plastic or the chemical additives end up inside of us?

There are many chemicals added to polymers to create plastics as mentioned earlier. The two that I will focus on as a model that are shown to have the greatest negative impact on our health are DEHP and BPA. Until recently there were few studies on the safety of these chemicals because they are so beneficial in the manufacturing process due to their variability of use and low cost - the manufacturers, government, and consumers have been more focused on benefits.

These two chemicals are used in medical and dental supplies, water bottles, food packaging, and baby bottle nipples. In fact, DEHP and BPA can be found in almost all plastics. Children's toys are almost always carriers of these toxins even video games! Ask children to think about what their younger siblings do with their toys particularly infants. They put them in their mouths! We eat foods wrapped in these toxins, sleep in beds made of them, and drink from milk cartons and water bottles - we are feeding these toxins to ourselves. When we consume toxins we run the risk of getting sick.

The Food and Drug Administration (FDA) is the government agency designed to regulate companies and inform the public about the safety of our food and drugs. Food and drugs have to be packaged therefore; the packaging is also under their jurisdiction. So, it is the FDA's job to regulate and test products for the safety of these chemicals. They do this by testing and then recommending the amount or dose of certain chemicals to ensure safety. This can be compared to the food pyramid and the recommended daily allowances of certain foods (also created by the FDA).

The FDA's recommendation for BPA and DEHP are based on averages. Why might this be a problem? This could be demonstrated by having each student secretly grab what they believe to be an average amount of popcorn or candy. Then have them compare amounts and draw the conclusion that average can be relative to

size. This could be further explored by having kindergarten or first grade students do the same thing then have the class compare the younger kids with the older ones. The class could then draw parallels to average chemical doses. You could also use medicine as an example in that kids take smaller amounts than adults because they weigh less. In the end, they should understand that the recommended daily allowance of chemicals such a BPA and DEHP should be different for children than adults - it is not. The other alarming issue is that of exposure since there is no way of knowing how much of these chemicals we are ingesting in a day. Also, what about daily accumulation over time? These factors are also not taken well enough into account.

The FDA uses animals to test the safety of food, drugs and chemicals. How sure can we be that humans will respond the same way? The answer is alarming either way - if we do then the health effects are quite disturbing; if we don't, then what does happen to humans?

BPA when tested on mice at lower than FDA recommended allowances (which were set in 1988) resulted in many abnormal health effects: female and male reproductive abnormalities such as early puberty, reduced sperm count, and genital irregularities. There is evidence of prostate disease and cancer, diabetes, obesity, impaired immune function, behavioral effects, and brain effects. The behavioral effects include hyperactivity and aggression. The brain effects may cause impaired learning and atypical social behaviors.[12]

Ninety five percent of urine samples from people in the U.S. have BPA [13] and children have higher concentrations than adults. When compared to the rise in the diseases associated with BPA exposure to the rise in production of things like plastic water bottles (one of the most common carriers of BPA) one can question the recommendation of the FDA for this chemical. In fact, we can question whether it should be on the market period.

Children are the most susceptible due to their low body weight, higher rate of consumption, and they breathe faster. Children commonly consume foods from cans such as infant formula, chicken soup, and ravioli. These products have higher than average levels of BPA.[14] It seems that children are getting exposed at higher rates via baby bottles, sippy cups, and water bottles as well. The country of Canada and Patagonia Inc. pulled polycarbonate bottles (Nalgene bottles) from their shelves all together in 2007 and 2005 respectively.[15] Yet the FDA continues to see no real problem with BPA.

DEHP is as disturbing. The health effects of DEHP in human testing are most disheartening for infant males: male reproductive malformations, sperm damage, asthma, and thyroid effects. They are exposed while still in the womb via medical procedures performed on their mothers, breast milk, food, and mouthing DEHP infested objects. There are also implications for females including: early puberty, female reproductive tract disease, and premature delivery.[16]

Four years ago, China banned the use of PVC with DEHP in food wrappers due to its harmful effects.[17] It seems that fatty, oily foods like meat absorb the DEHP and it is then transferred to humans. Heating foods in plastic containers increases the concentration of DEHP.[18]

The potential effects of these chemicals on human health are alarming to say the least. There are other chemicals found in plastics that are questionable as well. I have provided details on the two most common as a model of the possible effects on human health however, when the students complete the inventory in the first student activity they may or may not identify DEHP and BPA as an ingredient in the most common plastic

trash. The lesson is designed for students to research the particular plastic they identify as the most abundant in the classroom and find the implications for the environment and human health. The students will then explore our current recycling system for plastics.

Recycling Plastics

Only five percent of the plastics manufactured are recycled (this is why the Pacific Ocean is full of plastic).[19] Our current system for recycling plastics is insufficient. Plastics are numbered from one to seven based on their chemical composition. The number is generally located on the bottom of the package.

	PLASTIC	COMMONLY USED IN	OK WITH FOOD?
1	Polyethylene Terephthalate (PET, PETE)	Soft drink, water, juice, mouthwash, and ketchup bottles; peanut butter, jelly, and pickle jars; microwavable trays	Yes
2	High Density Polyethylene (HDPE)	Milk, water, juice, shampoo, and detergent bottles; shopping bags; cereal-box liners	Yes
3	Polyvinyl Chloride (PVC)	Various containers and hard packaging; medical tubing and bags. Contains phthalates.	Better to avoid
4	Low Density Polyethylene (LDPE)	Bags for bread, newspaper, frozen food, and garbage; squeeze bottles; shrink-wrap; coatings for milk cartons and hot-beverage cups	Yes
5	Polypropylene (PP)	Yogurt, margarine, and takeout containers; medicine bottles; ketchup and syrup bottles	Yes
6	Polystyrene (PS)	Cups, plates, bowls, and cutlery; takeout containers; aspirin bottles. Contains styrene, a possible neurotoxin.	Better to avoid
7	Other: includes polycarbonate	Polycarbonate is used in baby bottles, sippy cups, reusable water bottles, and food-can liners. It contains bisphenol A.	Better to avoid

[20]

This chart is particularly helpful because it tells you if the plastic is safe to use with food. As you can see with 3, 6, and 7 food safety is an issue. However, they continue to be widely used and not recycled for many reasons.

A product's ability to be recycled depends upon many variables: chemical composition, the market for the recycled product, proximity to recycling center, and cost. The most commonly accepted plastic at recycling centers are #1, #2, and #4. There is not a market for #3, #5, and #7 so they are discarded to landfills. Also, these plastics come in the form of things like shower curtains and pipes which people don't think to recycle so the demand is low. 7, on the other hand, is very difficult to recycle due to its chemical composition.

The after-market value of recycled plastic is of concern. A recycling center must be able to sell recycled plastic to a manufacturer that has the ability to process and use the recycled material. This is not always possible geographically or financially feasible for the recyclers or the manufacturers.

Sorting seems to be a major issue. If you don't remove caps, labels, and sort properly according to accepted numbers the entire batch will end up in a landfill as it requires different methods to recycle different types of plastics.[21] The students will be sorting trash in the first student activity and creating a new coding system for plastics as they discover the diversity of plastic trash and inadequacies of our current coding system.

Student Activity 2

Objective: Students will research plastics and create a new coding system for recycling plastics.

Essential Questions: What is plastic? How do we dispose of it? How does it affect human health?

Procedure:

1. Students will research plastics used in food packaging and will discover the dangerous chemicals: BPA and DEHP. Generate a class list of questions to guide reading.
2. ttp://www.eia.doe.gov/kids/energyfacts/saving/recycling/solidwaste/plastics.html
3. ttp://www.thegreenguide.com/doc/114/bpa
4. ttp://www.thegreenguide.com/doc/77/plastics
5. Have students research how plastics are disposed: http://www.satyamag.com/apr07/moore.html
6. ttp://science.howstuffworks.com/great-pacific-garbage-patch.htm#
7. Investigate the recycling coding system and determine if it is sufficient. http://www.nontoxiclife.com.au/pdf/SAFE%20USE%20OF%20PLASTICS%20QUICK%20GUIDE.pdf
8. ttp://www.ides.com/resources/plastic-recycling-codes.asp
9. Students should then design a new coding system (guide students to include chemical dangers associated with plastic food packaging).

Closure: Some plastics are dangerous to our health and environment. They contain chemicals such as BPA and DEHP which can cause cancer, behavior disorders, and reproductive problems. These chemicals leach into our food from packaging and into our water through landfill leaching. The new coding systems should help warn people of the dangers so they can make informed choices when purchasing food packaged in plastic. What if we could also reduce our use of plastic?

Schools and Their Food Trash

American school children generate sixty seven pounds of lunch trash per school year.[22] Over the course of twelve years of school that adds up! 1.2 billion pounds of space could be freed each year if every public school attending American child packed a waste-free lunch. Children would know that they can help save the planet

by making the landfills last longer. [23]

How does this compare with waste generated per day on average by Americans? The average American produces 4.4 pounds of trash per day. A line of full garbage trucks could reach the moon with the amount of trash generated in America each year alone. We could bury 990,000 football fields under six feet of waste.[24] What analogies could students generate about school lunch waste? The students can use local school data collected in the first student activity to determine amounts they create and compare to national averages.

Additionally the costs of prepackaged lunches are astronomical. It costs an average of $723.60 per school year to buy prepackaged lunch components, or $4.02 per day. If students pack waste-free lunches it would only cost $477 per year or $2.65 per day.[25] Students could also calculate the costs as an additional learning activity.

What Can We Do?

Clearly, there are numerous issues resulting from food packaging: trash accumulations, toxins from plastics contaminate the environment, animals and humans; our recycling system is insufficient, and prepackaged lunch foods are costly. The objective of this unit is to inspire action on the part of the students. The second and third student activities call for the students to define the food waste problem in their school and generate solutions. The easiest, fastest solution will be to make the switch to reusable containers. They will create a campaign to encourage their homeroom classes to do the same. As the school year progresses they will collect ongoing data and determine whether or not their campaign is working. If it is not working then what can we do? If it is working, how can we convince more grade levels, schools, and families to make the change?

Learning to recognize human impact on the planet is difficult. Families are busy and sometimes it is inconvenient to do the "right thing." However, we are the only ones who can control our actions. The solution to some of our environmental impact is easy to fix - simply use reusable containers! Students will find strength in their ability to help save our planet. They will use many skills in doing so such as sorting, graphing, drawing conclusions, defining problems, researching, generating solutions, and most importantly taking action to make our world a better place!

Student Activity 3

Objective: Students will investigate the alternatives to plastic and design a campaign to encourage the use of reusable containers.

Essential Questions: What are the alternatives to plastic? What can I do to decrease the amount of plastic that I use? How can I encourage others to do the same?

Procedure:

1. Investigate the alternatives to plastic especially in food packaging. You can assign different websites to different groups and do a jigsaw (each group shares what they learn).
2. tp://www.savvymom.ca/index.php/newsletter/its_your_choice/2
3. tp://www.thegreenguide.com/doc/108/plastic
4. tp://environment.about.com/od/greenlivingdesign/a/school_lunch.htm
5. tp://ezinearticles.com/?Drink-Safe—The-Dangers-of-Plastic&id=1269652
6. tp://www.nanowerk.com/news/newsid=1280.php
7. tp://environment.about.com/gi/dynamic/offsite.htm?zi=1/XJ&sdn=environment&cdn=newsissues&tm=123&gps=470_1051_1020_567&f=00&su=p504.1.336.ip_&tt=2&bt=0&bts=0&zu=http%3A//www.laptoplunches.com/
8. The students will come to the conclusion that the easiest most cost effective way to reduce their personal plastic use is reusable food containers.
9. How can they convince their families and others?
10. Tell students that you are going to have a contest between all of the fourth grade classrooms. The classroom that reduces their food packaging trash by the most will win. I encourage using the concept of "winning by helping to save the planet" as the motivation rather than a tangible prize.
11. The contest is for teams to create a campaign to convince their fourth grade homeroom to make the switch to reusable containers. They may choose to compose a song, poem, write a children's book, poster, commercial or anything that you deem appropriate. The teacher should approve student plans before they complete their project. Plans should include research and may apply to other homerooms as well.
12. After the campaign has been deployed ask students if they think they made a difference. Which homeroom wins? How do you know for sure? Students should return to lesson one and collect trash, sort and graph results.
13. Compare to original data and draw conclusions:
14. Yeah! We made a difference! How can we reach more people? Could we convince the government to have stricter guidelines on the use of plastic in food containers?
15. This campaign did not work. What else could we do?

Closure: Students have taken action to help the environment and protect their health. Reflect on the process of tackling a problem and how it feels to make a difference in the world.

Notes

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9. J. Silverman, "Why is the World's Biggest Landfill in the Pacific Ocean," 1, http://science.howstuffworks.com/great-pacific-garbage-patch.htm.

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11. J. Wargo, "Plastics That May be Harmful to Children and Reproductive Health," 38-39, http://www.ehhi.org/plastics/pr_plastics_report08.shtml.

12. J. Wargo, "Plastics That May be Harmful to Children and Reproductive Health," 21-24, http://www.ehhi.org/plastics/pr_plastics_report08.shtml

13. A.M. Calafat, et. al., "Urinary Concentrations of Bisphenol A and 4-Nonylphenol in a Human Reference Population, Environmental Health Perspectives," 113, no. 4:5.

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16. J. Wargo, "Plastics That May be Harmful to Children and Reproductive Health," 42-44, http://www.ehhi.org/plastics/pr_plastics_report08.shtml.

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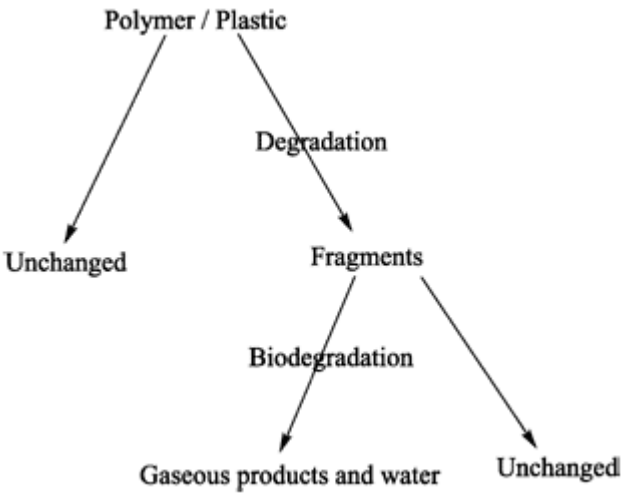

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Implementing District Standards

1. M4P5 Students will represent mathematics in multiple ways. a.Create and use representations to organize, record, and communicate mathematical ideas.
2. udents will develop these skills by creating and interpreting graphs with the data collected from trash.
3. S4CS1 Students will be aware of the importance of curiosity, honesty, openness, and skepticism in science and will exhibit these traits in their own efforts to understand how the world works. a. Keep records of investigations and observations and do not alter the records later. b. Carefully distinguish observations from ideas and speculation about those observations. c. Offer reasons for findings and consider reasons suggested by others Students will develop these skills continuing to collect data from trash, researching plastics, and developing a plan of action.
4. S4CS5 Students will communicate scientific ideas and activities clearly.

5. . Use numerical data in describing and comparing objects and events. d. Locate scientific information in reference books, back issues of newspapers and magazines, CD-ROMs, and computer databases.
6. udents will use graphs of collected data, research plastics, and inform classmates of findings.
7. ELA4LSV2 The student listens to and views various forms of text and media in order to gather and share information, persuade others, and express and understand ideas. a.Shapes information to achieve a particular purpose and to appeal to the interests and background knowledge of audience members. b.Uses notes, multimedia, or other memory aids to structure the presentation. c.Projects a sense of individuality and personality in selecting and organizing content and in delivery. Students will develop these skills via campaign to reduce food packaging waste.

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