**Lesson #3 – Plastic Pollution:** (from a unit on Littering)

**I. Problem #13:**

* *Carl noticed that some of the children on the school playground would throw their snack wrappers on the ground while other children would take their wrappers inside and throw them in the waste basket. Carl wondered why different children did different things with their trash. Carl also wondered if it was a “problem” to throw trash on the ground in the schoolyard and if so, why is this a problem? Carl also wondered where the trash in the waste basket goes and if there are any problems getting rid of the trash. Carl would like to know if there is anything he can do to help eliminate trash on the school playground and whether there is a way to reduce the amount of trash that he and others create.*

**II. Knowledge to be Learned:**

* + **Declarative Knowledge:**

Pollution happens when people or animals leave garbage or substances in nature and those items cause harmful changes in the environment. Similarly, littering is when people throw away garbage by dropping it on the ground. Littering contributes to pollution in the world therefore, it is one of the causes of pollution. When people leave plastic garbage in the environment it can affect many plants and animals in a negative way. For example, when families have picnics on the beach and they throw plastic six-pack rings in the beach’s garbage can, some of these plastic rings end up back on the beach. Sometimes birds get these plastic rings caught around their feet or beaks. These poor birds then are unable to walk or get food and can die from this pollution.

Plastic pollution is when plastic items are left in the environment and cause harmful changes to it. Specifically, plastic pollution is harmful to fresh water and marine animals because they can become tangled in it or mistake it for food. In this lesson, I will mostly focus on the effects of plastic pollution on marine animals. Plastic is a dangerous pollutant because most plastic material is non-biodegradable meaning it does not get broke down by the elements present in most natural habitants. This also means that most plastic material permanently stays in the environment so it has more of an opportunity to cause harm to plants and animals. In the ocean, many marine animals mistake plastic bags as food so they swallow them. As this plastic accumulates in the intestine of these animals it causes them to starve therefore, causing their slow death. This is a terrible way for them to die and it can easily be avoided. In the above example, if the families simply cut up the six-pack rings birds would not get caught in them. Also, if plastic bags are return to recycling centers, they would fall off garbage barges or if people were careful not to throw them on the ground, they would not end up in the ocean so marine animals would not eat them. Therefore, if people are aware of the dangers of plastic pollution, they could easily avoid causing it.

* + **Procedural Knowledge:**

Analysis, application, classification, discussion, hypothesizing, identification, inference, interpretation, observation, problem solving, recognition, synthesis

**III. Objectives:**

1) Students will be able to recall what plastic pollution is and why it is harmful to marine animals. (Knowledge Level of HOTS)

 *Students will be evaluated by answering oral questions during the sorting activity that are asked by the teacher. The teacher will use an “understanding checklist” to grade oral questions.*

2) Students will be able to show how to sort out which kind of plastic waste is more harmful to marine animals and which is less harmful. (Application Level of HOTS)

 *Students will be evaluated by the teacher observing how each student is able to sort the items during the sorting activity. The teacher will also use an” understanding checklist” to grade this objective.*

3) Students will be able to explain how to dispose of harmful plastic items so they do not pose a threat to marine wildlife. (Comprehension Level of HOTS)

 *Students will be evaluated by writing a paragraph describing how to dispose of harmful plastic items. The teacher will provide a list of the items the students need to write about and will grade them using a rubric which are attached.*

4) Students will be able to create a poster with a picture of a marine animal and kind of plastic waste that is harmful to it. This poster will also include a fact about plastic waste that affects this animal. (Synthesis Level of HOTS)

 *Students will be evaluated using a rubric to grade this poster activity.*

**IV. Preparation:**

* + **Purpose:**

The purpose of this lesson is to be in agreement with the *New York State Learning Standards for Mathematics, Science and Technology*. This lesson specifically is related to:

 **Standard #1 – Scientific Inquiry – key ideas #1, 2, 3**

 **Standard #4 – The Living Environment – key ideas #7**

* + **Materials provided by the Teacher:**

See attached activity plans for these materials (each activity has a different list).

* + **Advanced Preparation:**

Two weeks before the start of this lesson the teacher will send a letter to the students’ parents asking for their participation in the collection of plastic waste for a week (the parents will need to assist in the cleaning of certain plastic items before they are brought into class). Then the students will collect their families’ plastic waste for a week and bring it in on the indicated day.

* + **Teacher References:**

- Albert, Toni (1993). “Plastics Can Be Deadly” in *Endangered Oceans*. Greensboro, NC: Carson-Dellosa. 22-23 pgs.

- Bright, Michael (1991). *Polluting the Ocean*. Scholastic .

- CEE (1992). “Plastic Jellyfish” in *Aquatic Project WILD: Aquatic Education Activity Guide.* Bethesda, MD: Project WILD. 170-171 pgs.

\*\**Endangered Oceans* is available at the TMC in the SUNY Cortland Memorial Library and the other two sources will be provided by the teacher\*\*

* + **Material provide by the Students:**

- Plastic waste materials from home

- Writing utensils

- Science notebook

**V. Procedure:**

 **A. Introduction/Anticipatory Set: (50 minutes – Day 1)**

1) The teacher will start the lesson by asking questions that refer back to previous lessons such as:

- “What problem solving skills did we use in the first and second lessons?”

- “What is garbage?”

- “What happens to most garbage that is not picked up?”

- “What is littering?”

- “What can people do to help stop littering?”

- “What should people do with garbage? Throw it on the ground?”

**\*\* The Teacher will keep track of student responses on the understanding checklist that is attached. If students have trouble with particular questions please note that. \*\***

2) Then the Teacher will ask the students questions about animals that live in the ocean. Questions such as:

 - “What kinds of animals live in the ocean?”

 - “Do whales live there? How about sea turtles? Fish? Seals?”

- “What kinds of animals live close to the ocean but not in it? Seagulls? Pelicans?”

3) The Teacher will list the kinds of creatures the students reply with on a the chalkboard under the heading of “Animals”

4) Then the Teacher will ask the students: “What kind of garbage do you think ends up in the ocean? Could it come from houses and cities along the shore? Maybe from people on the beach? Where else could it come from?” Then create a list next to other one of student responses of the kinds of garbage. Encourage students to come up with certain garbage by asking:

- “Does plastic bags from stores such as Wal-Mart end up in the ocean?”

- “How about those six-pack plastic rings? Do they end up in the ocean?”

- “Do any of you go fishing? Do you sometimes get your fishing line caught? Do you think fishermen leave fishing line and nets in the ocean?”

- “What does biodegradable mean?” Define on board for students.

\*\*Biodegradable = material that is broken down by living things

- “If this is what biodegradable means, what does non-biodegradable mean?” Give hint: “non—“ means the opposite of a words usual meaning when attached to a word.

Create a list of this garbage on the chalkboard under the heading of “Pollution” then ask the students “Out of this list, what is made of plastic?” Then cross out the stuff that is not plastic.

5) The Teacher will give the student s K-W-L Chart. Then ask the students to write in the “K” column of the chart what they already know about plastic waste that harms marine animals from the two lists on the board. To help students ask:

- “Could things in the garbage list harm creatures in the animal list?”

6) After they are done filling as much in the “K” column as they can ask them to fill in the “W” column of the chart with what they want to know about plastic pollution in the ocean. Ask:

- “What do you want to know about plastic pollution in the ocean?”

7) Then the Teacher will collect the students’ K-W-L charts and keep them for the end of lesson.

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**B. Body of the Lesson/Input:** (50 minutes – Day 2)

**\*\*Students need the plastic waste they collected for a week today\*\***

1) **ENGAGE: (steps 1-2)** First ask the students to put their desks in a semi-circle. Put a table in the middle of the semi-circle (this is also where you will stand). Then have the students get their plastic waste they collected in pairs and have them place it on the table.

2) Next have the student sit back down and take out their Science Notebooks. Tell them :

 - “As we do this activity, we are going to create a chart.”

Show them on the board what the chart should look like. *See attached example Sorting Chart.*

3) Next review the previous day’s information by asking:

 - “What did we learn yesterday?”

 - “What animals live in the ocean?”

 - “What kind of plastic waste gets into the ocean?”

- “Do you think this waste could harm these animals?” Point to waste in the middle of the table.

\*\*The Teacher will kept track of students responses on a understanding checklist for that day and will note any information the students seem to not understand. \*\*

4)**EXPLORE: (steps 4-6)**  Now divide the class into equal groups and give each group some of the waste on the middle table. Make sure each groups gets different types of plastic waste!!

5) Tell each group to classify each piece of waste according to if they think it will be likely that marine animals would mistake it as food or get tangled in it or if they think it will be NOT be likely that marine animals will mistake it as food or NOT get tangled in it. Also have them hypothesize what kind of animal they think the waste would effect and what it would do to that animal.

6) After each group has finished or mostly finished classifying their waste as each group to explain some of their findings to the class. Make sure to pick different waste from each group for them to explain with the class. The Teacher can make a Master chart on the board of all the groups’ answers. After you are finished, have the students return to their seats.

7) **EXPLAIN: (steps 7-9)** Next tell the class:

- “I am going to read you a story called *Polluting the Ocean*. I want everyone to listen while I read and notice what ocean animals are affected by pollution and what plastic waste harms them.”

8) Read the book to the class taking time to point out when ocean animals are harmed by plastic waste in the book. Ask the students:

 - “What is hurting this animal?”

 - “Do we have this kind of waste in our collection of plastic waste?”

 9) Next, ask the students:

 - “What kind of pollution hurt most of the animals in the story?”

 - “So is plastic waste harmful to ocean animals?”

 - “What kind of plastic waste hurt animals in the story?”

10) Homework: The Teacher will write the homework question on the board and tell the students they should write at least one paragraph to answer it. The Homework questions is:

- What kind of plastic waste harms ocean animals? What animals do plastic waste effect and how does it affect them? Also, how do you think you could stop plastic waste from hurting ocean animals?

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**C. Closure:** (50 minutes – Day 3)

1) First collect last night’s homework. Then review the previous day’s information by asking:

 - “What did we learn yesterday?”

 - “What kind of plastic waste pollutes the ocean?”

 - “What ocean animals are effected by plastic waste?”

 - “How does this plastic waste harm these animals?”

\*\*The Teacher will kept track of students responses on a understanding checklist for that day and will note any information the students seem to not understand. \*\*

2) Next take one piece of each kind of the plastic waste from yesterday and ask:

- “What can we do to this plastic waste to minimize the harm to ocean animals?”

- “Could we cut up these six-pack rings?”

- “What could we do to this fishing line? Cut it too?”

- “What could we do with this plastic bag? Recycle it? Cut it too?

Demonstrate to the class how to appropriately dispose of these materials while you are talking.

3) Then summarize all of the information the students have learned so far. Ask the class:

 - “What is plastic pollution?”

 - “What kinds of plastic waste end up in the ocean?”

 - “What kinds of animals live in or around the ocean?”

 - “How does plastic pollution effect these animals? Be specific!”

 - “What can people do to lessen the effects of plastic pollution?”

- “Specifically, how can you get rid of plastic six-pack rings and bags so they do not harm ocean animals?”

4) Then say: “We have learned a lot about plastic pollution in the ocean. Do you think it is important to help reduce plastic pollution? What would happen if we did not try to reduce plastic pollution?” After responses from the students say: “It is very important for us to try to reduce plastic pollution because if we do not try, many of the ocean creatures we talked about could go extinct. Then we would have no more sea turtles or seals or pelicans and they are important parts of our world.”

5) Then hand out the K-W-L charts from earlier in the lesson and have the students fill in the “L” column of the chart. Collect these charts when they are finished.

6) Homework: Final Project

 The Teacher will hand out the worksheet with the directions and materials for the project and say “This is your final project for the lesson. Read quietly to yourself the directions and I will answer any questions you have. When you are done reading raise your hand I will call on you to get your materials off the table but only if you are quietly raising your hand.” *For an example homework Final Project worksheet see the attached sheet.*

**Links to Next Lesson:**

The Teacher will ask:

* “What problem solving skills have we used?”
* “What skills do you think we still have to use?”
* “What other types of garbage are there?”
* “What makes them different from plastic waste?”

Then discus the students’ responses with the class.

**D. EXTEND: (part D)**

Create a Litter Patrol. Each day have two students patrol the school play ground during recess for plastic waste that other people have left there. Have the students collect the waste and dispose of it the correct way. Rotate students each day and continue until all students have done it at least once.

**E. Evaluate:**

 **Formative Assessment:**

* Teacher generated oral questions recorded on an understanding checklist
* K-W-L Chart completed by the students
* Homework #1 – short essay answering question

**Summative Assessment:**

* Homework #2 – Final Project – Poster activity

**Evaluation of the Teaching Process:**

* Understanding checklist
* K-W-L Chart

\*\*The Teacher will compare these two evaluations to his/her own objectives to see if he/she achieved the desired results. \*\*

**Sample K-W-L Chart**

|  |  |  |
| --- | --- | --- |
| KWhat do you know? | WWhat do you want to know? | LWhat did you learn? |
| *I know plastic is flexible.* | *How does plastic hurt whales? Their so big!!* | *Plastic bags, six-pack rings, packaging, and bottles can be mistaken as food by whales, seals, and sea turtles.* |
| *Bags are made of plastic.* | *Does plastic hurt birds?* | *Whales eat plastic and then they starve because it stays in their bodies.* |
| *Whales, seals, and sea turtles live in the ocean.* |  | *If you cut up plastic six-pack rings, birds won’t get caught in them.* |
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**Sample Sorting Chart**

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **Plastic Waste** | **Likely to be mistaken for as food** | **NOT likely to be mistaken for as food** | **Ocean animal it would effect** | **How would it effect this animal?** |
| *Plastic Bag* | *X* |  | *Sea turtle* | *It would choke.* |
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**Sample Rubric for Homework #1**

|  |  |
| --- | --- |
| **Possible Points** | **How to get that amount of points** |
| 30 | At least a paragraph long. Answered the whole question correctly. Almost no spelling or grammar miskaes. |
| 25 | At least a paragraph long. Answered the whole question correctly. Very few spelling and grammar mistakes. |
| 20 | At least a paragraph long. Answered most of the question correctly. A few spelling and grammar mistakes. |
| 15 | Not at least a paragraph long. Answered most of the question correctly. A few spelling and grammar mistakes. |
| 10 | Not at least a paragraph long. Answered question only partially correct. Some spelling and grammar mistakes. |
| 5 | Not at least a paragraph long. Did not answer the question correctly. A lot of spelling and grammar mistakes. |
| 0 | Did not hand it in! |

**Sample Understanding Checklist**

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| --- | --- | --- | --- | --- | --- |
| **Name** | **Question** | **Completely** | **Partially** | **Having Trouble** | **Not at All** |
| *Sarah Jones* | *What is plastic pollution?* |  |  | *X Does not understand pollution* |  |
| *Tim Snow* | *What plastic pollution hurts a whale?* | *X* |  |  |  |
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**Sample Homework #2 Worksheet – Final Project**

***Directions:***

***1)* Read the attached information and choose a fact about an ocean animal (choose a fish, pelican, or sea turtle) and write it NEATLY in the box below.**

|  |
| --- |
| **Plastic Pollution Fact:** |

 **2) Now color in the ocean animal you chose. See attached coloring sheets.**

 **3) Now cut out your Fact and your Ocean Animal and place it on a poster.**

 **4) Put a Title on your poster and include a plastic waste item that is harmful to your Ocean Animal. (Try to match your waste to your fact)**

 **5) Put your name on it and hand it in. You’re Done!!**

**Plastic Can Be Deadly**

*Read this article and pick a fact out of it to copy.*

**![MCj01050000000[1]]() Did you know? Plastic containers and other forms of man-made garbage pollute the sea. Over 14 billion pounds of trash are dumped into the ocean every year. In 1986, the National Academy of Sciences reported that 639,000 plastic containers and plastic bags were tossed into the sea every day! Ships of all kinds—military, recreational, transport, and fishing ships—dump their garbage into the water. We generate so much garbage on land that we are running out of places to put it, so more and more garbage is ending up in the sea. Plastic in the ocean will be around for a long time, because most plastic won’t break down for hundreds of years.**

![MCj01050000000[1]]() **Plastic trash is deadly to many animals in the ocean; it kills as many as a million animals a year. Plastic waste can cut, strangle, poison, and drown turtules, seabirds, sea mammals, fish and other marine life. Seabirds die from eating plastic pallets and beads, which they mistake for fish eggs or plankton. Certain chemicals, called PCBs, that are found in plastics cause some birds to lay thin-shelled eggs that break before the young birds are ready to emerge. Sea turtles die when they eat plastic bags, which look like jellyfish. Fur seals strangle, drown, or starve when they become tangled in plastic nets and six-pack rings. Many marine (ocean) animals get tangled in six-pack rings or fishing line.**

*\*\*This information was taken from Endangered Oceans “Plastics Can Be Deadly” by Toni Albert. \*\**

**Sample Rubric for Homework #2 -- Final Project**

|  |  |
| --- | --- |
| **Possible Points** | **Description** |
| 70 | Missing none of the required items on the worksheet. Poster looks appealing, neat, and presentable. |
| 60 | Missing only one of the required items on the worksheet. Poster looks neat and presentable. |
| 50 | Missing less than half of the required items on worksheet. Poster looks neat and presentable. |
| 40 | Missing less than half of the required items on worksheet. More neat parts than sloppy\*\* parts on poster. |
| 30 | Missing less than half of required items on worksheet. A little sloppy\*\* poster. |
| 20 | Missing more than half of the required items on worksheet. Some sloppy\*\* parts of poster or did not complete coloring Ocean animal. |
| 10 | Missing more than half of the required items on worksheet. Very sloppy\*\* poster. |
| 0 | Did not hand project in!! |

\*\***sloppy** means that you did not finish coloring the Ocean Animal, the fact and animal are not fully attached or placed in such a way that it is hard to understand your poster, your hand-writing is hard to read, and/or your plastic waste item is not neatly attached to your poster\*\*