

Everything Flows to the Ocean

Lesson Focus: Marine Debris

Learning objectives:

- ✓ Students will develop the understanding that all things are connected.
- ✓ Students will realize the importance of balancing human needs and sustainability of the environment.
- ✓ Students gain technology skills which transfer to post secondary goals.

Enduring Understandings for the lesson:

- ✓ Human activities affect the waterways and oceans.
- ✓ The disposal of solid waste impacts the environment at local and global levels.

Georgia Performance Standards Addressed:

SCSh9. Students will enhance reading in all curriculum areas by:

- b. Discussing books
 - Discuss messages and themes from books in all subject areas.
 - Respond to a variety of texts in multiple modes of discourse.
 - Relate messages and themes from one subject area to messages and themes in another area.
 - Evaluate the merit of texts in every subject discipline.
 - Examine author's purpose in writing.

SEV5. Students will recognize that human beings are part of the global ecosystem and will evaluate the effects of human activities and technology on ecosystems.

- a. Describe factors affecting population growth of all organisms, including humans. Relate these to factors affecting growth rates and carrying capacity of the environment.
- b. Describe the effects of population growth, demographic transitions, cultural differences, emergent diseases, etc. on societal stability.
- c. Explain how human activities affect global and local sustainability.

- e. Describe the effects and potential implications of pollution and resource depletion on the environment at the local and global levels (*e.g.* air and water pollution, solid waste disposal, depletion of the stratospheric ozone, global warming, and land uses).

f. Describe how political, legal, social, and economic decisions may affect global and local ecosystems.

Grade level: 11th -12th

Materials:

- ✓ Anchoring graphic organizer
- ✓ *The Lorax* by Dr. Seuss
- ✓ Computer with Internet access
- ✓ Power Point
- ✓ Poster paper
- ✓ Markers, crayons, and/or color pencils
- ✓ Copies of Project Aware Fact Sheets

Time needed: Two 55 minute class periods.

Background information:

From chemicals to plastics to the introduction of invasive species, our aquatic ecosystems have been negatively impacted by humans. Our water systems are all interconnected and all water flows to the ocean, this impact is seen and felt worldwide. Marine debris affects organisms and the delicate ecosystems of the ocean.

For example, one thousand miles off the coast of California is an area of biological diversity that is under attack. Known as the North Pacific Ocean Gyre, pollutants are being caught in a swirling soup of debris. The source of the contamination has not been pin pointed but materials from across the world have ended up in this region including fishing nets, small pieces of plastics, fishing line and tackle, and commercial debris. The discovery of the "Pacific Garbage Patch" has heightened awareness but scientists, environmentalists, and researchers are still very concerned about the amount of marine debris contained in our waterways and oceans and the impact it is having on marine ecosystems. Plastics are of particular concern as they do not biodegrade and remain in the waterways to wreck havoc on the inhabitants.

A classroom investigation can be launched to follow recent discoveries in conjunction with the study of human environmental influence. Technology skills can be taught in conjunction with the curriculum through Internet investigation. Many students are familiar with the effects of pollution on their local environments but are unfamiliar with the extent of pollution in our waterways and ocean. A lesson linking the degradation of the rainforest by humans beginning with the story the *Lorax* can help students link the familiar to the unfamiliar when studying marine pollution.

Learning Procedure:

1. Break into small groups. Read *The Lorax*, by Dr. Seuss.
2. In their small groups, ask students to discuss the story and impact humans had on the local ecosystems.
3. Bring the whole group together and discuss the concept of deforestation and degradation of the rainforest.
4. Next have students reform into their small groups and research and complete the anchoring graphic organizer with regard to marine debris using the following Websites:
 - NOAA Marine Debris Web site
<http://marinedebris.noaa.gov/welcome.html>
 - EPA Web site
<http://www.epa.gov/owow/oceans/debris/MarineDebrisFINAL.pdf>
 - PBS Web site
http://www.pbs.org/newshour/indepth_coverage/science/plasticoceans/slideshow_raft/index.html?type=flash
 - Article in Discover Magazine <http://discovermagazine.com/2008/jul/10-the-worlds-largest-dump>
 - Project Kaisei <http://www.projectkaisei.org/background.html>
 - Scripps Institution of Oceanography - SEAPLEX
<http://sio.ucsd.edu/Expeditions/Seaplex/>
5. When finished have the small groups share their discoveries with the larger group and compare and contrast the state of the ocean as compared to the state of the rainforest.
6. Next distribute copies of Project Aware Marine Debris - The Facts
http://www.projectaware.org/uploadedFiles/Home/Take_Action/International_Cleanup_Day/Marine%20Debris%20Factsheet%20Low%20Res.pdf
Have student read and compare the information presented to that obtained in the student research. Are there any similarities? Differences?
7. Based on the information discovered in their research, have students create a presentation on marine debris. The presentation can include a power point, a public service video, poster presentation, rap, a poem or song.

Evaluation:

1. Small group presentation of information to the large group highlighting the information discovered in their Internet research.
2. Use of technology - Power Point Presentation, public service video, poster presentation to present information and possible solutions to the problem.
3. Teacher - use the rubric provided or create your own using rubistar to evaluate the presentations.

Extensions:

1. Have students participate in local river cleanup through the Rivers Alive program. www.riversalive.org
2. Have students create public service posters to distribute throughout the school highlighting marine debris and steps necessary to stop the problem.
3. 3. Have students conduct interviews of teachers, friends, parents, etc. to discover their knowledge of marine debris and its impact on our ocean and what they are doing or will promise to do personally to reduce and eventually eliminate it. If the above interviews are video taped or recorded on audio tape they may be used to produce a local radio report or a local cable television report.
4. Ask students to research whale entanglements in fishing gear and ask them to design gear that will eliminate this pervasive problem. Ask them to be specific about the composition of their replacement materials.
5. Site the current disaster of the California wildfires and ask students to list problems and potential solutions including what is being done to prevent chemical introduction of flame retardants into the watershed.

Resources:

- ✓ Geisel, T. S. (1971). *The Lorax*. New York: Random House.
- ✓ Anchoring Routine Concept Map - Laureate Education, Inc. (Executive Producer). (2008). *Designing curriculum, instruction, and assessment for students with special needs*. Baltimore.

Lesson developed by: Candice R Jones, Morrow High School

This activity is a product of the Rivers to Reef Teacher Workshop sponsored by the Georgia Aquarium and Gray's Reef National Marine Sanctuary that the author participated in. For more information about this workshop, Georgia Aquarium, or NOAA Gray's Reef National Marine Sanctuary, please visit our websites at www.georgiaaquarium.org or <http://graysreef.noaa.gov/>



Concept Anchoring Routine

Use this graphic organizer to help you plan a lesson using the concept anchoring routine.

Grade level: _____ Content area: _____

Anchoring Table		
Known Information ↓	Known Concept	New Concept
	Characteristics of Known Concept	Characteristics Shared
		Characteristics of New Concept
Understanding of New Concept:		

Example
Concept Anchoring Routine

Use this graphic organizer to help you plan a lesson using the concept anchoring routine.

Grade level: __11__ **Content area:** _Environmental Science_____

Anchoring Table			
Known Information ↓	Known Concept Human degradation of the forest cause harm to the terrestrial ecosystem		New Concept Human degradation of the ocean causes harm to freshwater and marine ecosystem
<p>Humans use natural resources</p> <p>Misuse causes habitat destruction</p> <p>The Lorax and the relationship to destruction of similar ecosystems</p>	<p style="text-align: center;">Characteristics of Known Concept</p> <p>Humans are accountable for their actions</p> <p>Natural resources can be renewable or non-renewable</p> <p>The "Once-lers" did not preserve the environment and polluted it</p> <p>All inhabitants in the book suffered</p> <p>Pollution caused everything to leave</p> <p>The one seed and care can change things</p>	<p style="text-align: center;">Characteristics Shared</p> <p>Humans must be aware and accountable for byproducts associated with use of the environment</p> <p>The world is connected All actions influence other parts of and other ecosystems</p> <p>Resources are limited</p> <p>Pollution affects everyone and everything</p> <p>Technology and research can prevent and if implemented in time correct negative environmental impacts</p>	<p style="text-align: center;">Characteristics of New Concept</p> <p>Plastics and other debris are collecting in a specific area of the ocean</p> <p>Accumulation of garbage is causing health problems and death for the organisms which occupy this ecosystem</p> <p>Growing problem which increases over time</p> <p>Science and technology along with research, public awareness and new methods for disposal can begin to solve the problem</p> <p>Everything flows to the oceans</p>
<p>Understanding of New Concept: All ecosystems and organisms are connected. Human influence through use of resources causes pollution which affects all living and nonliving things. Awareness through scientific research allows the development of technologies which can correct or prevent habitat loss and collapse.</p>			

Group Presentation -- Research Project : Marine Debris

Teacher Name: _____

Student Name: _____

CATEGORY	4	3	2	1
Ideas/Research Questions	Researchers independently identify at least 4 reasonable, insightful, creative ideas/questions to pursue when doing the research.	Researchers independently identify at least 2 reasonable ideas/questions to pursue when doing the research.	Researchers identify, with some adult help, at least 4 reasonable ideas/questions to pursue when doing the research.	Researchers identify, with considerable adult help, 4 reasonable ideas/questions to pursue when doing the research.
Plan for Organizing Information	Students have developed a clear plan for organizing the information as it is gathered and in the final research product. All students can independently explain the planned organization of the research findings.	Students have developed a clear plan for organizing the information in the final research product. All students can independently explain this plan.	Students have developed a clear plan for organizing the information as it is gathered. All students can independently explain most of this plan.	Students have no clear plan for organizing the information AND/OR students in the group cannot explain their organizational plan.
Evidence of Content	Students provide evidence of discovery of new research concerning marine debris webs and list groups conducting investigations. Identify point and non point source pollution and provide theories associated with debris accumulation.	Students provide evidence of discovery of new research and relate to other instances of human environmental influence.	Students provide evidence of discovery of at least basic concepts of point and non point source pollution.	Students provide minimal evidence of discovery of investigations into marine debris.
Further Understanding of the Content	Students define and explain clear understanding of human influence on the ecosystem. Should be able to answer questions associated with pollution, and habitat destruction, as well as steps taken to sustain the environment. Discuss ways to reduce pollution in their communities.	Students are able to discuss human influenced environmental factors affecting the ecosystem and steps taken to combat habitat destruction	Students able to discuss human influence on the ecosystem as a whole.	Students provide evidence of factors leading to habitat destruction.
Technology Use	Presentation exceeds technology requirements - slides and/or presentation flows, color scheme is consistent, few distractions, spelling correct, content matches information found, contains reference information	Presentation meets technology requirements - slides and/or presentation flows, consistent, few distractions, spelling correct, contains reference information	Presentation needs additional organization to meet technology requirements and/or is missing 2 requirements - slides and/or presentation does not flow, color scheme is different, distractions, spelling errors, or content errors, does not contain reference information	Presentation needs additional organization to meet technology requirements and/or is missing 3 requirements - slides and/or presentation does not flow, color scheme is different, distractions, spelling errors, or content errors, does not contain reference information

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