Curriculum Units by Fellows of the Yale-New Haven Teachers Institute
1997 Volume VI: Global Change, Humans and the Coastal Ocean

Long Island Sound-A Research Skill Approach

Curriculum Unit 97.06.10
by Linda MacNaughton

As I organized this unit I have encountered the same challenges I have faced as a displaced science educator teaching a class entitled “Study Skills”. My task would be clear as a science teacher. So many of the topics included in the Yale New Haven Teachers Institute seminar “Global Change, Humans, and the Coastal Oceans” coincide with the eighth grade science curriculum. As a teacher of “Study Skills” my approach must be quite different.

There is no specified curriculum for “Study Skills” at Betsy Ross Arts Magnet School. Students assigned to the class have been deemed inappropriate for a foreign language due to poor test results, below level reading skills, difficulties with written communication, and/or lack of success in the major subject areas. With no prescribed curriculum I aim to facilitate my students to become more competent in their major subjects and learning in general.

To this end I have chosen to focus this unit on completing research emphasizing the use of appropriate library skills, including the interpretation of graphic data to clarify the materials being researched and the use of visual aids to foster a clearer presentation of research in both oral and written formats

The paper has been developed to extend the knowledge of eighth grade students regarding Long Island Sound as they expand their basic research skills.

They will achieve this goal as they trace the formation of the Sound and follow the changes that have altered the Sound. They will reach an appreciation of the importance of the Sound to all in its watershed. Students will develop a clearer comprehension of the serious implications for all life on and within the Sound as they see how human interaction with the water and land has caused a serious threat to the environment. Students will understand how they can contribute to halting and reversing conditions destroying the Sound.

This unit will enhance the acquisition of the basic skills my students so desperately need while assisting them in preparation of a required oceanography research paper for their science class. While the required report covers a wide variety of topics in Study Skills class we will focus on those related to Long Island Sound. As we complete research on those topics students will gain the skills necessary to continue independently on the other areas.

This unit will also prepare my students for participation in collaborative and interdisciplinary efforts of the Betsy Ross Arts Magnet School team. Students will utilize research to prepare for a town meeting on Long

Island Sound.

After completing research students will present their findings to the Study Skills class orally using graphics to underscore their presentations. This will allow students to become more confident with oral presentation in preparation for the town meeting.

BACKGROUND INFORMATION ON TOPICS FOR RESEARCH AS WELL AS THE STUDY SKILL COMPONENT OF THE TOWN MEETING.

FORMATION OF LONG ISLAND SOUND

The formation of Long Island Sound dates back about 200 million years to the time when land masses that are now North America and Africa began to break from the supercontinent Pangea and drift away from each other. Sediments from the erosion of the landmasses were washed into the forming Atlantic Ocean. These sediments amassed along the coastline to form the Atlantic Coastal Plain and the continental shelf extending under the ocean. Concurrently, rivers flowing into the ocean cut valleys. Initially the Long Island Sound basin was a broad river valley lying between Connecticut' coastal plain and the hills of what is now Long Island.

The formation of the Sound continued as the Northern Hemisphere continental glaciation began three million years ago and covered the land from Canada to New York and Connecticut. There were many advances and retreats of the glaciers. The sea level dropped dramatically as increasing amounts of water became trapped in the glacier. These immense glaciers scoured the land and carried sediments, rock and eroded materials as they advanced over the land sculpting the Connecticut landscape with features still familiar to us today.

When the most recent glacial advance occurred it reached the southernmost point of what is now Long Island. The limit of the ice was determined by the line along which loss of ice by melting and evaporation exceeded the rate of supply by flow. At that point the ocean was 400 feet lower than today and the coastline was 150 miles south of Long Island.

At the edge of the glacier deposits of sediments and rock in moraines of various sizes resulted. One large moraine (Ronkonkoma) formed in the middle of Long Island at the point where the glacier first halted. As the glaciers continued to retreat and again paused, another moraine (Harbor Hill) formed at the north shore of Long Island. This moraine stretched the length of the old river valley that had been widened and deepened by the grinding action of the glacier and a barrier formed around it. As the glacier melted the area now known as Long Island Sound filled with fresh water and formed a glacial lake that remained for several thousand years. The lake water overflowed the moraine. The force of the water probably created a channel at the eastern end of the Sound allowing the glacial lake a drainage pathway.

The glacier continued to melt causing the sea level to rise to the point where ocean water flowed into what had been a lake until probably 8,000 years ago. Long Island Sound was an inlet of the sea, an estuary, with water entering and exiting through a single opening at the eastern end near what is now the Race.The rising sea level reached a second opening to the ocean near New York City. About 5,000 years ago the sea level stabilized.

AN ESTUARY CALLED LONG ISLAND SOUND

Long Island Sound is an estuary, a partially enclosed body of water where salt water from the ocean combines with fresh water. Most estuaries have only one connection to the ocean but Long Island Sound has two; one at the eastern end at the Race and a second to the west through the East River and New York Harbor. Most of the fresh water enters the Sound from a series of rivers running southward, the Connecticut River, The Housatonic River and the Thames River. Long Island sound is approximately 110 miles in length and 21 miles in width at its widest point. The Connecticut, Westchester County, New York borders the Sound on the north and Long Island is to its south. At the Race massive quantities of water rush through the narrow inlet causing the strongest current in the Sound and a 350-foot deep channel. The convoluted shoreline and the complex topography of the ocean floor help to produce a complex pattern of tides and currents. The major source of " fresh" water driving the estuary comes from the East River. This water is less saline than the water reaching the Sound from the open ocean but it is not really fresh.

ESTUARY LIFE

As the home of numerous species of organisms and plants, the estuary is among the most valuable and liveliest ecosystems. Estuaries are considered one of the most productive ecosystems on the earth. Long Island Sound is one of about 900 estuaries along the United States coastline. A wide variety of conditions exist within an estuary allowing a multitude of different marine organisms to thrive. In some parts of the estuary the water may be very deep, perhaps 350 feet. In other area the water is shallow. The amount of salt in the water varies as well as the depth. These varying conditions give rise to a wide diversity of life within the estuary. For example, the starfish requires the saltiness of the sea and therefore lives only in the areas of high salinity. Crabs and oysters however, can survive where there is only 5 parts of salt per 1,000 gallons of water. Thus they are found where the water is almost fresh, where streams enter the Sound.

Salt water is denser than less saline or fresh water thus it sinks in the estuary tending to make the bottom saltier than the surface. Strong tidal mixing in most parts of Long Island Sound diminishes this effect. This also affects the organisms residing in the estuary. Some sea animals inhabit an area farther up the estuary but the increased salinity of the bottom provides the required environment.

Other conditions, such as weather and the seasons, are factors affecting the habitat of marine organisms. In the rainy spring rivers are full of rainwater and melted ice. As this increased volume of fresh water flows into the estuary, the water decreases in salinity and some organisms must relocate in order to survive. During the summer rivers carry less rain water and the salinity of the entire estuary increases allowing organisms requiring higher salt content to venture farther up river.

The rise and fall of the tides also impacts the organisms living within the Sound. At the western end, where the connection between the Sound and the ocean is via the narrow East River the tide level varies to a greater degree than at the eastern end of the Sound.

Marine plant and animal life, existing within the Sound must be able to withstand a water temperature range of almost 32 °F in the winter to 75° F in the summer. A combination of the factors determine which organisms are capability of surviving in the Sound and where within the Sound.

HABITATS

A habitat is defined as an animal's or plant's immediate surroundings, a specific place within the community where conditions are favorable to survival. Long Island Sound has a number of habitats, which provide

nursery, breeding, and feeding areas for fish and wildlife. There is a wide range of diverse organism's ranging from microscopic plant animals, seaweed, shellfish, crustaceans, and finfish. Wildlife such as birds, sea turtles and marine mammals live all or at least a portion of their lives in the Sound, on its shores or in its watershed.

TIDAL WETLANDS

Organisms of the intertidal zone must be able to survive the constantly changing conditions of their environment, being submerged in water and then exposed to the air as the tide change. At the low tide border of this zone we find the tidal flats, submerged under water most of the time. Plant life is basically microscopic algae, which provide food for worms and small shellfish living just below the surface of the sediment. During low tides a variety of birds feed here. At high tide shrimp crabs come in to feed in the shallows. Many important species of fish are dependent on the flats for survival in the early stages of life.

Further up the intertidal zone are the salt marshes, regions of major importance in terms of the organisms living there and as a protection to our environment. They serve as a transitional zone between the land and aquatic systems. In this area dominated by rooted plants that are covered by water at high tide and exposed at low tide. An acre of Long Island Sound salt marsh can produce over 2.7 tons of grasses, algae, and other organic matter each year, almost twice the production rate of a wheat field, Two thirds of all marine species depend on the tidal wetlands for a portion of their life cycles. Crabs, barnacles, snails, and other shellfish inhabit this region in addition to mice, turtles, and muskrats. Even raccoons, red foxes, and weasels utilize the salt marsh as hunting grounds. The salt marshes are also home to numerous species of birds, providing shelter, food and ideal breeding grounds. Many migratory birds winter along this area.

Salt marshes help to trap sediments and pollutants, acting as a purifier of runoff water before it enters the Sound. It stores flood waters and reduces the wave energy during storms.

Approximately 25% to 30% of the Sounds tidal wetlands have been destroyed during the last century by filling, dredging, and development. Salt marshes have been destroyed to about half, or 25,000 acres.

ON THE BEACH

Beaches are the transitional sandy shoreline areas between the Sound and the land. They are in a state of constant change due to erosion and deposition caused by the tides, currents and winds. The beaches of the Sound are home to numerous small organisms living beneath the sands to escape the intense rays of the sun.

Many rare plants and animals such as the prickly-pear cactus, golden aster, beach heather, and the piping plover inhabit this ecosystem. The two-legged, sun-glassed, radio-toting sunbather is another frequent visitor to the beaches of Long Island Sound. Unfortunately, it frequently overexposes itself to the intense rays of the sun and suffers the consequences.

BENEATH THE WATERS OF LONG ISLAND SOUND

The subtidal zone, constantly submerged beneath the water, supports organisms on or in the seafloor (benthos) and those in open waters (pelagic). Benthic organisms range in size from microscopic bacteria to large lobsters and flounders that swim along the ocean floor. Beds of rooted plants like eelgrass and widgeon grass grow on the shallow bay bottoms below the spring low tide mark. These beds provide a vital refuge for juvenile fish and lobsters while they also serve to hold sediments and utilize nitrogen compounds from the water column, thereby improving the quality of the water. Clusters of oysters and blue mussels form shellfish reefs, sitting atop the soft sediments. These reefs provide shelter for a variety organisms while the shellfish

improve the water clarity by filtering out much of the algae and particulate matter in the water column.

The Sound offers many narrow inlets with greater freshwater flow. These areas with shallow waters, deeper sediments and a more restricted flow than the open Sound have become the best production sites for bay scallops.

Lobsters, the most commercially important crustacean in Long Island Sound, utilize the rocky crevasses and mud to burrow and feed on small fish and animals, even other lobsters. After hatching from eggs, larval lobsters are part of the zooplankton community. After shedding its exoskeleton four times during growth, lobsters settle to the bottom where growth and molting continues throughout their lives or until the unfortunate crustacean finds itself in a boiling pot of water. Data on commercial catches show the greatest density of lobsters in the western Sound.

The open water (pelagic) communities of the Sound abound with living organisms. The upper waters of the pelagic zone are the home of microscopic algae and plankton species crucial to the survival of all living things in the Sound. As producers of oxygen for other life forms in the Sound as well as important food for the many herbivores of the Sound plankton is essential to the nutrient and energy cycles.

The open waters are home to a large number of finfish important to the commercial and sport fishermen. Long Island Sound's recreational and commercial fishing industries provides hundreds of millions of dollars annually to the region and greatly enhance the economy of the area.

The finfish of Long Island Sound may be species that inhabit the waters year-round or migrate at predictable intervals. Others are merely occasional visitors. There are two primary types of fish in the Sound, anadromous fish and saltwater fish. The first is born in freshwater, spends its life in saltwater but returns to freshwater to reproduce, or spawn. The best known of this variety includes the Atlantic salmon, striped bass, and the American shad. The striped bass continues to be plentiful but the numbers of Atlantic salmon and American shad have been dramatically reduced due to industrial pollution, over-fishing and impassable dams erected on the river. The American eel has the opposite pattern; living in freshwater or slightly salty waters and passing through the Sound on their way to spawn in saltwater. The young eels return to the streams their parents once swam.

Saltwater fish are born in and spend their entire life cycle in saltwater. Some remain in the Sound year round while others migrate to warmer waters for a portion of the year. Winter flounder, black fish, and scup are just three varieties of the inhabitants of Long Island Sound.Sports fishermen from New York and Connecticut haven caught an estimated six million pounds of just these three species in addition to millions caught by commercial fishermen. Other abundant residents of the Sound include mackerel, blue fish and the sandbar shark.

Few marine mammals inhabit Long Island Sound. The harbor and gray seals are the marine mammals seen in the Sound with any regularity. They can be seen occasionally throughout the winter on the offshore rocky islands.

VALUE OF LONG ISLAND SOUND

Long Island Sound, located in the middle of one of the most densely populated regions of the United States, provides all the residents of the region with numerous recreational and commercial opportunities. Millions of non-residents vacation in the area and benefit from Long Island Sound. Research commissioned by the Long

Island Sound study estimated that close to $5 billion is generated annually in the regional economy from boating, commercial and sport fishing, swimming, and beachgoing. The Sound is utilized for cargo and petroleum shipping, and ferry transportation.

Whereas we can place a dollar value associated with the Sound as an economic resource, no amount can be placed on the Sound as an ecological asset. Equally impossible to measure is the aesthetic value of the Sound. There is immeasurable value to an enjoyable excursion to the beach, or the tranquilizing rhythm of its waters on the shoreline. All of us have benefited by the cooling breezes on a steamy summer day.

LONG ISLAND SOUND WATERSHED

We cannot understand Long Island Sound or appreciate the complexity of the problems within the Sound until we investigate the source of the water entering the Sound. The watershed is the entire land and water area that drains into a stream, river, lakes, estuary, or ocean. The Long Island Sound Watershed comprises all the land and water area that feed into the Sound not only from Connecticut and New York, but also Massachusetts, Rhode Island, Vermont, New Hampshire, and even Canada.The Sound's watershed is comprised of nine major watershed and innumerable smaller ones draining more than ten million acres. A drainage divide from which runoff water moves in opposite directions towards adjacent watersheds separates one watershed from another.

The largest component of the watershed is the Connecticut River and the basin it drains. More than 11,263 sq. miles are drained by the river that originates in Canada forms the boundary between New Hampshire and Vermont and bisects Massachusetts and Connecticut. Along its journey the Connecticut River picks up water from an area in excess of 7,208,000 acres. The Housatonic and Thames Rivers are other contributors, draining close to 2,000 sq. miles and 1,500 sq. miles respectively. Although there is no major river from Long Island, numerous small streams and creek do empty into the Sound.

The watershed is important because a condition on the land that makes up the watershed determines the purity of the water body into which they drain. The health and livelihood of Long Island Sound and its residents, human or animal, fish or fowl are directly linked to the conditions of the farms, forests, suburbs, and cities through which the water passes.

POLLUTION OF LONG ISLAND SOUND

As the depository of materials from such an extensive area, serving a massive population, Long Island Sound has developed many problems with far reaching implications for everyone in the region. The Long Island Sound Study was established to develop " comprehensive conservation and management plan designed to protect and improve the health of Long Island Sound while ensuring compatible human uses within the Sound ecosystem." The Study has identified six areas as requiring special focus:

(1) hypoxia, (2) toxic contamination, (3) pathogen contamination,(4) floatable debris, (5) the impact of these water quality problems, and habitat degradation and loss of the health of living resources and, (6) land use and development resulting in habitat loss and degradation of water quality, habitat loss and degradation of water quality. The Sound we know today is vastly different than the one enjoyed by early residents of the area. The increased population of cities with the accompanying residential and commercial development has adversely affected the quality of the water, changed the land surfaces, reduced access to the Sound and decreased open spaces within the watershed. As more land becomes paved over the ability of the land to filter increased runoff diminishes. The increased population has dramatically increased use of the land as a disposal

for human and other waste products.

The Sound is the receptacle of water from surface runoff, groundwater seepage, overflow from sewer and storm drains, industrial wastewater and even rain water falling directly into the Sound. Water from all these sources carry along pollutants as well. Pollutants damage the Sound's environment by killing organisms, causing genetic damage that weaken the organism and impair its offspring thereby upsetting the balance of nature within the habitat.

Sources of pollution are classified as point and nonpoint. A point source is a single identifiable source of pollution, any pipe or ditch spilling wastewater into the Sound or river flowing into the Sound. Nonpoint source pollution is diffuse in origin and in the manner it enters ground and surface water. Nearly every activity within the Sound's watershed can contribute to nonpoint pollution. Surfaces runoff from urban areas, farms, paved areas, garbage dumps, construction sites can be a source of pollution. Stormwater runoff, contaminated groundwater, and even overfertilized lawns are culprits in producing pollution.

HYPOXIA

As contradictory as it may seem, nutrients can be considered a pollutant if they are found in excessive concentrations. Nitrogen, phosphorus, and carbon are the nutrient elements that foster growth of algae. At the base of the food in the Sound algae obtains these nutrients from animal waste and decay of dead organisms. If excessive amounts of nitrogen compounds enter the Sound the growth of planktonic algae dramatically increases. The algae dies, settles to the bottom of the Sound where decay occurs, using up oxygen in the process.

The process becomes exacerbated during the summer when the warmer, fresher water floats on the top of the denser, cooler, saltier water. Two distinct layers form. This prevents mixing of surface and bottom waters. At the surface water is oxygenated by the atmosphere and photosynthesis. But the oxygen can not penetrate easily to the bottom layer. The decaying of the increased amounts of algae consumes the oxygen at a faster rate than it can replenish it. Hypoxia, a low dissolved oxygen level in the water, results. Low levels of dissolved oxygen have severe adverse ecological effects on the bottom water habitat of the Sound. Studies have shown from half to two thirds of the Sound experienced significantly decreased levels of dissolved oxygen during the summers of 1987-1993. These low levels can kill lobsters, starfish, and other sedentary species unable to move to higher oxygenated waters. The abundance and variety of adult finfish is reduced as they relocate to areas of higher oxygen. Hypoxia can also reduce the growth of winter flounder and lobsters and in some species prevent spawning.

Studies have shown that healthy marine life require a minimum of 3 milligrams of oxygen per liter of water (mg/l). The western end of Long Island Sound has experienced significantly lower amounts if oxygen than the central region. Levels below 1 mg/l and even the absence of any oxygen (anoxia) during the summer of 1987. Fish catches in the two areas were compared and showed that fish were more abundant in the oxygen-richer central basin.

TOXIC CONTAMINATION

Toxic contamination refers to naturally occurring and man-made substances that can cause damage or death to living organisms, adversely effect the ecosystem, or cause human health risks. Substances in this category include "heavy metals" such as copper, lead, mercury, cadmium, nickel, chromium, and zinc and organic substances like polychlorinated biphenyl's (PCBs) and polycyclic aromatic hydrocarbons (PAHs). All of these

substances can be harmful in fairly low concentrations. In addition to polluting the water, these toxins accumulate in the tissue of fish and shellfish. Pesticides are also included in this group of toxins.

Luckily studies reveal that toxic substances detected in the water have recently decreased following implementation of state and federal Clean Water Acts. Higher levels of toxins have been detected in the sediments in Black Rock Harbor, Bridgeport, Stamford, New Haven Harbors, Quinnipiac and Housatonic Rivers.

Studies conducted have shown the levels of toxins in shellfish are higher than that found in the water (bioaccumulation). Those levels have declined with improved treatment of industrial and sewage treatment plants following legislation. Bioaccumulation can cause organisms to have high levels of toxins and pose a health risk to seafood consumers. Many people have concern about risks involved in eating seafood. Public health advisories have been issued to inform consumers about risks. Advisories have been issued for striped bass, eels, bluefish, and lobster tomalleys due to elevated levels of PCBs.

PATHOGENS

Increasingly common beach closing have disappointed many beachgoers looking forward to a day of sun, sand, and swimming. But the implications of this unfortunate occurrence extend far beyond cancelled outings. Pathogens are viruses, bacteria, and protozoans (microorganisms) that can cause illnesses and diseases such as gastroenteritis, cholera, typhoid fever, Salmonella, or hepatitis A. Human exposure to pathogens can occur by direct contact with, or ingestion of contaminated water or by eating raw or partially cooked shellfish taken from contaminated waters.

The source of pathogens includes improperly or untreated human sewage discharges from combined sewer overflows, sewage treatment plant breakdowns, stormwater runoff, waterfowl and animal wastes, and septic systems.

Beaches are regularly checked by the health department which monitors the level of indicator organisms (coliform) and beaches are closed if levels exceed acceptable standards. Pathogen contamination also limits the use of shellfish such as oysters, mussels, and clams. These bivalves feed by filtering large amounts of water and removing food particles. Leading to a concentration of pathogens in their tissues. Other seafood such as lobsters, shrimp, and crabs do not filter the water for food and they are usually cooked before eating diminishing the likelihood of contamination.

FLOATABLE DEBRIS

Floatable marine debris,"floatables", is perhaps the easiest type of pollution to identify. This unsightly form of pollution mars the beauty of our beaches, can harm or kill wildlife, or pose a hazard to boaters and swimmers alike. Debris that frequently make their way to the Sound includes plastic, paper, glass metal, wood, rubber, cloth, and medical wastes. Plastic makes up 75% of floatables in Long Island Sound.

The largest sources of floatables are combined sewer overflow and water from storm drains. Fishing and recreational vessels contribute trash not to mention the sloppy beachgoer that carelessly litters the shores.

Students will have been given broad guidelines for the main topics of their oceanography report in their Science class. The areas we will be researching in Study Skills will coincide with the required topics of that oceanography report that concern Long Island Sound and areas pertinent to the town meeting on Long Island Sound that is part of the group requirement for Yale New Haven Teachers Institute.

Day 1

OBJECTIVES:

To introduce the topic of research and appropriate tools for research.

To have students see the need for researching skills for common activities.

To have students narrow the broad topics of the report to more manageable units.

A. Encourage discussion of the meaning of research with such as:
What does the term “research”mean ?
Why is it important to know how to do research?
When might you need to do research?
Try to relate the need to do “ research” to something concrete and pertinent to them:
You have been given $150.00 to buy a new bike. It will be the only bike you can buy until you are an adult. How do you decide which bike to buy? (This could just as easily be a family computer, a family car or even a boat to sail the Sound).

B. To narrow the general topic to provide a better focus for manageable research have students brainstorm on subtopics that they could more easily research. This provides the students with a more concrete beginning point. Have students use graphic organizers such as a web or a semantic map. This web contains the topics the class needs to research for their oceanography paper and for the town meeting on Long Island Sound. Key questions from the teacher can elicit a similar web.
See web in appendix.

C. Have students refer to the list of subtopics and discuss what tools might be used to research each. Where would we look to find out information on these topics?

Day 2

Give a brief overview of reference sources and the uses of each. Divide the class into small groups assigning each group a specific reference source. Each group is to develop a list of questions about the topics brainstormed yesterday using the assigned source. (Provide a copy of the web developed yesterday; do not rely on memory.)

After about 15-20 minutes have each group share their list of questions? Discuss if other sources could better

provide the desired information.

Day 3

Objective:

To utilize K-W-L strategy to provide and organization for students to generate ideas and foster interest in the research topic.

Select one strain of the web and develop as a large group to provide model for small group and individual research. As a class we will develop the topic of pollution of Long Island Sound to facilitate the anticipated town meeting.

Provide the students with a chart. Students will fill in the K column-what they KNOW about the topic. This step activates prior and topical knowledge and allows students to brainstorm ideas. Students categorize the information the y has generated and anticipate categories of information they may find in their reading. Guide the students to formulate questions for future reading. Students can now fill in the W column Đwhat I WANT to know column of the chart. Students will later fill in the L column-what I LEARNED column of the chart.

Day 4

Objective:

To assign students to groups in which they will develop questions on a specific subtopic to serve as a focus for research and prepare to begin research.

A. Divide class into groups and allow each group to select topic of interest. Each group will complete a K-W-L chart on their subject.
B. Set up learning log/research folder. Provide each student with a folder with pockets and prongs to accommodate loose-leaf paper. Color code folders by group and include 3x5 cards, 4x6 cards, or small notepaper. Include in the pocket original brainstorming lists,web, and information on reference sources.

Day 5

Objective:

To present the procedure for completing source cards on resources used to gather data.

A. Before you begin investigating your topic by looking for sources in your school or public library, instruct students on how to make a written record of the sources you might use. Write down the publication information from your sources, using a separate card for each source. Be sure to give each source card a number in the upper right hand corner. This procedure will allow you to refer to the source of information by number when you are taking notes instead of rewriting the title

each time and also help to prepare your bibliography
B. Library time
C. Use the W column of your K-W-L chart as a guide to look up possible sources using the card catalog to find the appropriate book. Skim the book to see if it provides the information you need. Look over the book's table of contents and index to find the section that may apply to your topic. Check for any illustrations, maps, diagrams, or other graphics. Make a source card for at least 5 sources of information. You may not use all these sources when you actually write your notes.

Day 6

***Objective** :*

To formulate a thesis statement.

A. Display a picture to the class. Ask them to think about what is happening. Have the students orally summarize the main idea of the picture.
B. Have students think about a favorite episode of a popular television show. Write a short paragraph to summarize your favorite episode. In a sentence or two have students explain the main idea (thesis) of the program. It is sometimes helpful to have them draw it first. They have written a thesis statement for the episode of the program. The writers began at that point and then developed the entire program to convey the thesis.
C. In their research group have students develop a thesis statement for their research. This statement will help them to focus on the purpose of their research and keep it fresh in their minds as they read and take notes.

Day 7

***Objective** :*

To develop note-taking techniques.

A. Before students can begin research in the library they need to develop techniques for taking notes. Explain the following guidelines and have them copy list for their folder.

¥ Use 4x6 index cards. This size will prevent any confusion with the source cards as well as have more room and they are easier to read.

¥ Put only one idea from one source on each card. When you are ready to begin writing the paper, individual cards are easy to arrange in the best sequence to convey the information in a logical manner. Adding new ideas or rearranging your data is simple when you use this procedure.

¥ As you take notes from the source, list only the number that is on the source card for that reference in the upper right hand corner. You will need this information later when you write your bibliography.

¥ Write a heading on each note card-usually a subtopic of your report.

¥ Write down main ideas in your own words. Summarize using key words, phrases or sentences. If you must copy something verbatim use quotation marks and indicate the page number of the quote. (You should already have the source listed by number in the top corner).

B. To provide students with practice with note taking distribute a copy of an article on nonpoint pollution to all students. Have the class take notes on the article. When students have completed their note taking evaluate process as class as a group answer questions :

What was the main idea of the article?

What important facts did the article discuss?

Did I include these facts in my notes?

What important statistics or quotations did the article state to support the main idea?

Day 8

Objective:

To reinforce note-taking skills.

Provide the students with a copy of an article taken from *Long Island Sound Study,* pg. 4 on "How is the Sound used and what is its value?"

Explain to students that the information in the article is extremely important and must be forwarded by telegraph to someone in Australia. They are to read the article and then send the main idea and any supporting details in a telegram of 25 words or less. Complete this activity as a large group with the first article. Provide additional articles for individual or small group work. Articles will all deal with areas needed to prepare for Long Island Sound town meeting.

Day 9

***Objective** :*

To reinforce note-taking skills in using lab activities. Both labs deal with areas students can utilize for the town

meeting. (They could be included as possible demonstration for that presentation).

The process of researching a topic can be less than exciting. These lab activities provide a welcomed change for all involved while expanding knowledge of the action of glaciers as seen in the formation of Long Island Sound and the mixing of water within an estuary like Long Island Sound and still developing note taking skills necessary for researching. See Labs in appendix.

Days 10, 11, 12

Objective:

To complete research using note cards.

Prepare students for trip to library and remind them of procedures for note-taking.

Remember to:

Use 4x6 index card or small note paper.

Write the heading on each note card-these should be the subtopics of the report

Write the number of the source card on top of each card.

As you read summarize the information in your own words. Include main ideas and statistics needed to support your ideas.

You've come a long way on your research journey . . . you're halfway there. Now it's time to research the materials you identified on your source cards and take notes.

Have students submit note cards at the end of day 9 so you can check to see if additional instruction or reminders are needed before they begin on days 10 and 11.

Day 13

Objective:

To review and collate data accumulated on note cards.

A. Have the students use the headings on the cards to sort cards into piles by topic. Decide what order would be appropriate.
B. Have students take out K-W-L sheets and use their notes to complete the last column.
C. Have students decide if they have material to fit their topics and subtopics. If they don't it's back to the search for additional sources.

***I have not included writing the first draft, revising it, and completing the final copy. Those areas were not

included in my objectives for this unit. This might be an idea for a later unit or an area of collaboration with Language Arts teachers.

Day 14

Objective:

To prepare a bibliography of materials used to complete research.

The process of completing a bibliography should be fairly easy using the 3x5 source cards prepared earlier in the unit. Explain to students that a bibliography is a list of books, magazines, and other sources from which you obtained information. It is arranged alphabetically, according to the first word, whether it is the author's name, editor's name, title of the book, or the article. All the lines in a bibliography entry are indented three spaces except the first one.

The general format for a book reference is

Author's name, last name first

Title, underlined

Book edition (if indicated

Place of publication

Publisher's name in full

Year of publication

The general format for a periodical is:

Author's name, last name first

Title of the article, in quotation marks

Name of magazine, underlined

Date of publication

Page reference

Have each research group complete a bibliography for their topic.

Day 15

Objective:

To investigate the use of graphic material to complement exposition in research.

Display to students the old adage "a picture is worth a thousand words" by showing a picture of damage caused by pollution in Long Island Sound and give a brief description of the scene. Ask students which more

effectively conveys the idea. Remind students that graphics are picture, diagrams, or other visual devices that present lots of information in a small amount of space.

Graphics can make their reports more interesting and help the reader better understand the information in their report especially if that information involves statistics.

Graphics can liven up a report, make a lasting impression, clarify a concept, and help the reader remember data.

***Special emphasis will be placed on this area in my class because of our participation in the collaborative presentation, an 8th Grade Town Meeting on Long Island Sound.

A. Using the text The *Sound Book,* class will look for examples of the use of graphics and how their inclusion added to the written information presented. Remind students to keep this in mind as they do research on their individual topics. Include topics that will be enhanced by graphics on your note cards with the pertinent statistics or data.
B. Review format to be used when using circle, bar, and line graphs by providing examples of each all using data pertinent to Long Island Sound. See appendix for examples of sheets.
C. Using the guidelines provided have students make graphs with the data given.

BAR GRAPHS

A bar graph is ideal to use when numerical facts or data are being compared.

This graph consists of a horizontal axis and a vertical axis. One axis is a number line and the other is a name line. Each axis must be clearly labeled. The graph must have a title that explains what the graph is illustrating. To draw a bar graph, mark off equal interval on the number line axis. Make sure the intervals have a scale that permits all the data to be included. On the name line axis, mark off one interval for each data item. These intervals should be equally spaced. All bars on the graph should be the same width. There should be spaces between the bars of equal width as well.

Make a bar graph to illustrate the Sources of Nitrogen Compounds in Long Island Sound
From the East River and Race 34,000 tons
Point Sources 26,000 tons
River and Streams 21,000 tons
Atmosphere 7,000 tons
Coastal Runoff 5,000 ton
PIE OR CIRCLE GRAPHS

Pie or circle graphs are used to show how one whole object is divided into parts. Each category of data is represented by a portion of the circle that shows the relative size of that category. Each part of the circle must be labeled with a % and a category name. Title the circle graph to explain what the graph illustrates. To construct a circle graph draw a circle. Find what percent of the whole each category represents. Use a protractor to draw each angle.

Draw a circle graph to show PERCENTAGE OF LAND IN THE LONG ISLAND SOUND WATERSHED.

Vermont 26.2

Long Island 1.4

New York City 0.4

New Hampshire 20.4

Massachusetts 18.3

Connecticut 32.6

Westchester 0.7

Draw a circle graph to show PERCENTAGE OF TOTAL LONG ISLAND SOUND WATERSHED POPULATION

Vermont 1.8

Long Island 4.6

New York City 41.8

New Hampshire 2.1

Massachusetts 8.8

Connecticut 37.2

Westchester 3.7

PICTOGRAPH

This is a type of bar graph used in non technical situations. In a pictograph rows or columns of symbols are used instead of bars to represent numbers of items. A pictograph must have a title, one axis labeled with the data items, a simple symbol to represent a given unit of data, and a key to show the value of each symbol. To construct a pictograph, draw one axis and mark off equal intervals for either rows or columns. There must be one interval for each data item. Select a simple symbol and assign a unit of data. At the bottom of the graph include a key to show the symbol's value. In each row or column draw the number to symbols to represent the data value. Equally space your symbols. A portion of a symbol may be used to represent a part of a unit of data.

LINE GRAPHS

A line graph is a graph in which connected line segments show the changes in data, usually over time. You can use a line graph to help make prediction about future trends. To construct a line graph, use graph paper and draw a horizontal axis and a vertical axis. Put arrowheads on the axis and 0 at the point of intersection or origin. The horizontal axis is usually labeled with an independent variable. The vertical axis is usually labeled with the dependent variable. Label each axis clearly by writing the numbers or data on the grid lines. Give

each axis and the graph a title.

Bibliography

Arnold, Chester L., “Floatable Debris, Fact Sheet #8”, Connecticut Sea Grant Marine Advisory Program & New York Sea Grant Extension.

Atkin, John and Bangser, Jennifer, et al., The Soundbook, Norwalk, Ct., The Long Island Soundkeepers Fund, 1990.

Beristain, Melissa, “Nonpoint Source Pollution in Long Island Sound”, New York Sea Grant Extension program & Connecticut Sea Grant Marine Advisory Program, 1989.

Blau, Sheridan, et al., *The Writer’s Craft,* McDougal Littell, Inc., 1995.

Coultas, June and Swaim, James, *Strategies for Success in Writing* , Steck-Vaughn Company, 1995.

EPA, *The Long Island Sound Study,* New York State Department of Environmental Conservation Bureau of Publications, 1994.

Ford, Brent a., and Smith, P. Sean, *Physical Oceanograpy* , Project Earth Science, National Science Teachers’ Association, 1995.

Groves, D., *The Oceans: A Book of Questions and Answers,* John Wiley & Sons Inc., 1989.

Pringle, Laurence, *Estuaries . . . Where Rivers Meet the Sea* , Macmillan Company, 1973.

Sackett, Russell, *Edge of the Sea* , Time-Life Books, 1983.

Sherer, Thomas E., *The Connecticut Atlas, 2nd ed.* , Kilderatlas Publishers Co., 1989.

Stone, Lynn M., *Seashores,* Rourke Enterprises, Inc., 1989.

Stone, Lynn M., *Wetlands* , RourkeEnterprises, Inc., 1989.

Stowe, K., *Essentials of Ocean Science,* John Wiley & Sons Inc., 1995.

Turekian Karl K., *Global Environmental Change* , Prentice Hall, 1996.

Woodbury, David O., *When the Ice Came* , Dodd, Mead and Company, 1963.

LAB ACTIVITY

(figure available in print form)

LABACTIVITY

(figure available in print form)

(figure available in print form)