Great Lakes Watershed Investigations Teaching Unit

By Christine Geerer, Grosse Pointe Public Schools

**Target Grade and Subject:** 6th grade, Science

**Unit Overview:**

This is a three week unit (two weeks direct instruction, one week to complete a project) that follows several weeks of instruction on the water cycle, and where water is found on earth, including information on watersheds, groundwater and wetlands. It also follows instruction on invasive species. The science GLCEs addressed in this unit (below) are part of our 6th grade district curriculum.

This unit specifically addresses sources of water pollution in Lake St. Clair and what can be done to improve the condition of Lake St. Clair. Students will learn how human activities on land end up causing pollution problems in the lake. Students will learn the difference between point and nonpoint pollution, and what causes each. Students will experience stream monitoring on the Milk River, which is a direct drain to the lake, and will learn how environmental scientists determine stream and lake health. Students will also be exposed to a history of the area and efforts in recent decades to improve lake water quality.

I hope to give my students a solid understanding of water quality issues. I’d like them to be motivated, interested, and responsible citizens, and to understand the science behind environmental politics, so that they can fully participate in our democratic society. I always hope to hook a few kids into careers in environmental science as well…I regularly include a plug for MTU’s highly ranked environmental engineering program!

**Sources Consulted and Use of Books**

http://www.tltguide.ccsd.k12.co.us/instructional_tools/Strategies/Strategies.html#summary Integrating Technology into the Classroom using Instructional Strategies based on the research from: Classroom Instruction that Works by Robert J. Marzano, Debra J. Pickering, Jane E. Pollock. Accessed 7/22/09
- Provided summarization idea used on Tuesday of the first week.

- Homework assignment on DDT and PCBs, used on Wednesday of the first week.

- Classroom text, used on Wednesday of the first week.

Chadde, Joan. (2006) MEECS Water Quality Unit, Michigan Department of Environmental Quality. Central Michigan University, Mt. Pleasant, MI.
- Used on Tuesday, Thursday, and Friday of the first week and on Monday and Tuesday of the second week.

The Clinton River Watershed Council, 101 Main Street, Suite 100, Rochester, Michigan 48307 www.crwc.org
- The CRWC provides student monitoring guidelines, publicity, and support, collects our data, and serves as a resource for ideas to create stormwater awareness.
**Teaching and Learning Objectives:**

- Students will recognize common sources of point and non-point pollution for Lake St. Clair.
- Students will understand the relationship between land use and human activities within the watershed, and levels and types of pollutants in Lake St. Clair.
- Students will learn how stream health is assessed by chemical and biological factors.
- Students will engage in educating the public about ways to reduce water pollution in Lake St. Clair.

**Content Benchmarks Addressed:**

S.RS.06.17 Describe the effect humans and other organisms have on the balance of the natural world. (Science)

E.E.07.42 Describe the origins of pollution in the hydrosphere, (car exhaust, industrial emissions, acid rain, and natural sources), and how pollution impacts habitats, climatic change, threatens or endangers species. (Science)

6 – G5.1.1 Describe the environmental effects of human action on the hydrosphere (water). (Social Studies)

6 – G5.1.3 Identify the ways in which human-induced changes in the physical environment in one place can cause changes in other places. (Social Studies)

**Classroom/Field Activities:**

The following occurs after three weeks of instruction on the water cycle, water use, watersheds, stream flow, groundwater, wetlands, and invasive species.

Most days start with a science journal question (bellwork). Students are given about five minutes to write, then share their answers in a class discussion.

**Monday:**

(No journal, this activity takes the entire class period.)

Lake St. Clair: Use or Abuse?
This is a role-play activity that simulates a variety of sources of pollution in Lake St. Clair. Students are asked, at times, to choose to “pay” or “pollute”. Others will contribute to nonpoint pollution without realizing the impact. Other students will lose their jobs if the water is not clean enough to fish, swim, or dive.

(See attached document)
Tuesday:

1. Journal question: Ask students to list as many sources of pollution as they can remember from yesterday’s activity in their science journals.
2. Create a list on the board.
3. Define point and nonpoint pollution.
4. Ask students to work at their tables (on white boards) to classify the sources listed as point or nonpoint. Review their answers and discuss.
5. Show “After the Storm” video included in MEECS water quality curriculum.
6. Summarizing activity: Students work with others at their table to create a mind map (on white boards) showing the main idea and at least four supporting facts learned from the video. One student from each table will share the mind map with the class.
7. Discuss the examples in the video. Which were point pollution? Which were nonpoint?

Wednesday:

1. Journal question: Define point and nonpoint pollution. Give two examples of each.
2. Give notes on first two sections of Ch. 3-3 notes handout. (See attached document.) While giving notes, include animation of combined sewage overflow. [link]
   Discuss how this process reflects the process in Grosse Pointe Woods. The Milk River pump station functions like the pump station in the animation. Show students the number of recent overflows from the Milk River pump station: [link] And recent e.coli test results: [link]
3. Students will read Ch. 3-3, pp. 97-104, in Earth’s Waters by Prentice Hall Science Explorer. Students may work with partners. They should complete the Prentice Hall reading guide for that section.
4. Homework: Troubling Toxins from p. 51 of Exploring the Great Lakes by Patricia Westfield and Nan Soper, due Friday.

Thursday:

1. Journal question: What is a combined sewer overflow? What causes it? What problems does it cause?
2. Reading guide check – correct any wrong answers and turn in.
3. Land Use Activity: Show MEECS powerpoint from Lesson 4. Have students fill in p. 71 worksheet as you go through the powerpoint.
4. Students will receive a copy of p. 75 (line drawings of four land uses). Students should use their notes from p. 71 to describe the land use, problem, and best management practice. Each table (group of four) will submit one completed worksheet. Go over correct answers. Each table getting all four correct will get Jolly Ranchers!

Friday:
1. Journal question: How does land use affect water quality?
2. Homework check – trade, grade and turn in. (Discuss Michigan’s fish consumption advisories at this time.)
3. Who cares about water quality? (From MEECS curriculum, p. 127.)
   a. Pass out laminated role cards – one to each table: U.S. Environmental Protection Agency (EPA), Scientists, Water Plant Operators, Cities, Fishermen, Industries, Tourists, Citizens
   b. Each table should discuss why their group cares about clean water.
   c. Share reasons with whole class.
   d. Discuss: How can we tell if the water is clean?
4. Notes: How to measure water quality and how to prevent pollution – complete the Ch. 3-3 notes handout. (See attached document.)

Week 2:

Monday:

1. Journal: How can we tell if a stream or lake is clean?
2. MEECs PowerPoint on Macroinvertebrates as a Measure of Stream Health
3. Macromania Adventure educational game, available from LaMotte
   http://www.lamotte.com/pages/edu/5942.html

Tuesday:

1. Journal: Comparison of Two Streams from MEECS CD.
2. MEECS PowerPoint on Designing a Stream Investigation as a review before trip.
3. Review assignments, dress, behavior, etc. for trip tomorrow.

HW: Milk River history article, questions due Thursday.

Wednesday:

Milk River trip – See attached supply list, sample student assignment list and instruction sheets for GREEN water quality monitoring tests, available through LaMotte
http://www.lamotte.com/pages/edu/5848.html

Reporting documents are found here:
http://www.crwc.org/programs/streamleaders/participants.html We participate in the Clinton River Watershed Council’s student monitoring program. I will include p. 170 from the MEECS curriculum, because I think it’s more student-friendly than the CRWC’s habitat form.

I have parents drive students to the Milk River. Each parent is in charge of two or three students and one or more tests/surveys. Tests can be duplicated as needed to involve more students. Each parent gets a clipboard with the test instructions and a recording sheet. One parent will get the stream/habitat assessment worksheets and one will be in charge of getting
kids started with the macro survey. Also, one parent and group of students is responsible for taking pictures and videotaping the trip.

Thursday:

1. Journal: What did you learn at the river yesterday?
2. Homework check: trade, grade, turn in.
3. Review trip results. Complete the macroinvertebrate survey form using an overhead transparency, so students can experience the process.
4. Watch the trip video.

Friday:

1. Journal: What can be done to improve the water quality of the Milk River and Lake St. Clair?
2. Brainpop: Water Pollution (go to www.brainpop.com – requires subscription.)
3. Complete the BOD test and fill out a final chemical data sheet, using an overhead transparency, so students can see how the rating occurs. (Mail the chemical data sheet, habitat survey, and macroinvertebrate survey to the Clinton River Watershed Council.)
4. Introduce Saving Lake St. Clair PowerPoint assessment project, and/or public awareness campaign project.

My intent here is to have most of my students complete the Saving Lake St. Clair webquest, which is differentiated at three different levels of complexity. Students work in groups of two or three and get about a week to work in class. Then, the PowerPoints are presented in class and graded.

I would like to further differentiate based on interest and ability, by choosing/soliciting volunteers, two or three students from each class period, to work on a public awareness campaign project. I am thinking they would produce a video for our school TV and also for the community cable channel, or write to local city councils and ask to make a presentation, or whatever the kids come up with. Since our biggest problem is combined sewage overflows, I would encourage them to focus, for example, on encouraging residents to install rain barrels. The Clinton River Watershed Council has a Stormwater Education Program and I think they will be able to help us. (http://www.crwc.org/programs/stormwater_ed/index.html) By focusing on a small group of highly interested and highly capable students, I think we can get a public product we can be proud of and one that might actually be effective in educating our citizens.

Unit Assessment: Students will be given four to five classroom days to work on the projects described above. They will then be presented to the class and assessed.

Other assessments during the “unit” include homework, reading guide, and journal entries.