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EDUC 4337

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| **Lesson Title:** Macroinvertebrate Testing  |  **Date:** Day 4 |
| **Unit Title:** Environmental Justice |  **Subject:** 7th grade social studies |

**Objectives/Learner Outcomes and Assessments** (formal and informal)

* 1. By the end of the lesson, students will
* Collect macroinvertebrates from the Menomonee River
* Identify different species using a dichotomous key
* Assess the water quality and draw conclusions based on their findings
* Analyze how pollution affects both natural and social systems in Milwaukee
	1. For each of the above outcomes, what DATA or EVIDENCE will you use to evaluate each of your learning outcomes (be sure to address this for each outcome)? (Give a brief description)
* Cooperative group work, including completion of dichotomous key
* Informal assessments of student understanding and ability to analyze findings during small and whole group discussions

**Standards Addressed**

DPI.SS.A.8.1 Use a variety of geographic representations, such as political, physical, and topographic maps, a globe, aerial photographs, and satellite images, to gather and compare information about a place

DPI.SS.A.8.4 Conduct a historical study to analyze the use of the local environment in a Wisconsin community and to explain the effect of this use on the environment

DPI.SS.B.8.2 Employ cause-and-effect arguments to demonstrate how significant events have influenced the past and the present in United States and world history

DPI.SS.E.8.6 Describe and explain the influence of status, ethnic origin, race, gender, and age on the interactions of individuals

DPI.SS.B.8.10 Analyze examples of conflict, cooperation, and interdependence among groups, societies, or nations

NGSS.MS.LS2.1 Analyze and interpret data to provide evidence for the effects of resource availability on organisms and populations of organisms in an ecosystem.

NGSS.MS.LS2.4 Construct an argument supported by empirical evidence that changes to physical or biological components of an ecosystem affect populations.

NGSS.MS.ESSS3.3 Apply scientific principles to design a method for monitoring and minimizing a human impact on the environment.

NGSS.MS.ESSS3.4 Construct an argument supported by evidence for how increases in human population and per-capita consumption of natural resources impact Earth's systems.

**Materials/Resources/Technology**

* Class definition of environmental justice
* Waders
* Tubs
* Flat nets
* Petri dishes
* Magnifying lenses
* Copies of dichotomous key (below)

# Section B: Introduction to Lesson

Purpose:

Today we will continue exploring environmental justice by conducting a life sciences experiment in the Menomonee River.

Prior learning:

During the last several classes, students have been exploring environmental justice, particularly in connection to Milwaukee. This lesson will depend on those understandings to learn about how pollution affects the Menomonee River. Other key ideas that will be drawn upon include understanding of climate change and marginalization.

In science class, students have been studying ecosystems and how organisms relate to each other. They have some experience using dichotomous keys.

**Section C: Content/Procedures/Sequence**

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| Content outline | Instructional strategies/learning tasks/sequence of activities (include what you *and* the students will be doing that supports diverse student needs) |
| Launch (15 min) | Once arrived at the boat launch in Three Bridges Park, students are placed in groups of 3 and put on waders.  |
| Activity (20 min)Activity: identification (10 min)Summarize (20 min) | Gather and explain the purpose: *Today we are continuing to explore environmental justice through life sciences. In science, you’ve talked about ecosystems and how organisms relate to one another. Today, we’re going to be investigating a certain system of organisms in the Menomonee River, called macroinvertebrates. Macroinvertebrates are small animals that don’t have a backbone. Our job today is to find as many different types of macroinvertebrates as we can in the river. Once we’re done, we are going to use a dichotomous key to identify all the macroinvertebrates we find. Then, we will be able to make conclusions on the quality of the river today. Scientists rate rivers’ water quality on a 4 point scale: 1 is poor, 2 is fair, 3 is good, 4 is excellent. Before we begin, let’s make a prediction as to how healthy you think the Menomonee River is today. Think about all you know about the river.*Allow students to share predictions and explain their reasoning. Demonstrate how to find the invertebrates. In groups, first student holds tub with a couple inches of water, second student holds net in the water, and third student starts about 10 feet up-river from the net and slowly walks toward the net, kicking up rocks on the bottom. Then, group holds the net out of the water, searches for invertebrates and puts them in the tub. After finding all invertebrates, clean off net, change locations, and repeat, rotating jobs. Rules:* Do not go deeper than the knees of the shortest person in group
* Do not run or walk backwards in river
* Set boundaries up and down river

Groups of students explore river, finding invertebrates. Teacher moves between groups monitoring progress.Students exit river, remove waders, and sit with group with tub full of invertebrates, petri dish, magnifying lenses, and dichotomous key. Review how to use a dichotomous key to identify organisms. Whenever they identify another invertebrate, circle it on the sensitivity chart.After all invertebrates have been identified, ask what students think “sensitive” and “tolerant” means on the chart. Work toward: some macroinvertebrates are more tolerant to pollutant than others; if we find more “sensitive” organisms, we can conclude the water is not very polluted, and vice versa. On a class copy, compile all invertebrates identified. Calculate water quality:* # of “very sensate” x 4
* # of “sensitive” x 3
* # of “tolerant” x 2
* # of “very tolerant” x 1
* Sum of 4 categories
* Divide by total number of invertebrates identified
* 1-1.5: poor; 1.5-2.5: fair; 2.5-3.5: good; 3.5-4: excellent

Discuss what the water quality found means. Why? What if we tested 6 months ago? 6 months from now? 10 years ago? 10 years from now? How does this relate to what we know about pollution and human activity in Milwaukee? How can the water quality be improved? Why should we care about macroinvertebrates? How does this elate to environmental justice? Who relies on the river? Is this just? |

**Section D: Closure**

Today we continued exploring environmental justice though a life sciences experiment. We examined invertebrates in order to assess the Menomonee River’s water quality and how this relates to pollution in our city.

Assignment

Groups worked together to identify macroinvertebrates and record findings on their chart. These charts will be collected to assess ability to use a dichotomous key. Class discussion at the end of the lesson serves as formative assessment for this investigation, as well as summative assessment for moving forward in the environmental justice unit. No further assignments will be introduced today.



