



ENVIRONMENTAL LITERACY MODEL (ELM)

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School/district: VCU (Virginia Commonwealth University) **Audience (grade/course):** MS & HS Preservice Science

CURRICULUM ANCHOR

DEFINING THE LEARNING OBJECTIVES AND CURRICULUM CONNECTION

What are the curriculum indicators, performance expectations, and/or student learning objectives?
Are there opportunities to meet academic standards in multiple disciplines or content areas?

VA Middle and High School: SOL .1- Science and Engineering Practices

- Sci 6.6 Importance of Water
- Sci 6.8 Watershed Systems
- Sci 6.9 Natural Resources/Environmental Public Policy Decisions

VA HS: Environmental Science:

DESCRIBING THE LOCAL CONTEXT

What is the local and life-relevant environmental issue, problem, or phenomenon that will serve as the context for learning?

The Monroe Park Campus of Virginia Commonwealth University, where our students study, is very close to the James River. Many of the students in the class use the river for recreation. We all have concerns about what is in the river and how this impacts our health. These preservice students are also concerned about how a variety of inputs impact their students lives. They would like to take their students to the river if it is safe.

IDENTIFYING THE DRIVING QUESTION

What is the open-ended, life-relevant question that meets academic standards/learning objectives?
Reminder: It should guide inquiry for the investigations and provide opportunities for environmental action.

How do the resident's use of pesticides, fertilizers, and sewage outflow during storms impact the James River health?

ISSUE INVESTIGATION

ASKING QUESTIONS AND DEFINING ISSUES

What are supporting questions that students may investigate to further explore the driving question? List the supporting questions that cover your required curriculum content and lessons, but leave at least one Issue Investigation open for those developed or co-developed by your students. Use the space to describe how you will guide them through this student-directed process. After completing your MWEE, add in the student-directed investigations.

Issue Investigation 1 Who is involved in developing this investigation? ☒ <i>teacher and/or</i> ☒ <i>students?</i>	Issue Investigation 2 Who is involved in developing this investigation? ☒ <i>teacher and/or</i> ☒ <i>students?</i>	Issue Investigation 3 Who is involved in developing this investigation? ☒ <i>teacher and/or</i> ☒ <i>students?</i>
What are the basic water quality characteristics of the James River on a given day?	What fertilizers and pesticides are frequently used by local residents? What is the impact of sewage overflow during storms on the James River?	How do the water quality characteristics vary over time at our site?

PLANNING AND CONDUCTING INVESTIGATIONS

How could students plan and conduct indoor and outdoor investigations to actively address the supporting questions? What kinds of data could be collected to draw conclusions and make actionable claims?

Issue Investigation 1 Is this investigation occurring ☐ <i>indoors and/or</i> ☒ <i>outdoor?</i>	Issue Investigation 2 Is this investigation occurring ☒ <i>indoors and/or</i> ☐ <i>outdoor?</i>	Issue Investigation 3 Is this investigation occurring ☒ <i>indoors and/or</i> ☒ <i>outdoor?</i>
1. Learn how to measure pH, DO, Nitrate, Phosphate, and Turbidity tests and macroinvertebrate identification. 2. Field trip to James River to	1. Research the types of fertilizers and pesticides used by local residents. 2. Research water quality data before and after storms. 3. Students will keep “MWEE	1. Visit the field site 3 additional times during the school year. 2. Investigate published water data.

ISSUE INVESTIGATION (CON'T)

ANALYZING AND INTERPRETING DATA

How could students analyze data (graphic, models, etc.) to reveal patterns and relationships?
What could the process of synthesizing evidence look like?

Issue Investigation 1	Issue Investigation 2	Issue Investigation 3
1. Develop a brief report highlighting the water quality on that specific day .	1. Develop graphs of water quality data from before and after storms. Graph data over time.	1. Graph data over time and look for patterns in the data as the school year progresses. 2. Compare their data to other data available from the city and regulating agencies.

CONSTRUCTING AND COMMUNICATING A CLAIM

How could you guide your students through the process of developing claims based on their evidence?
How may they communicate these evidence-based claims to internal and/or external audiences?

Issue Investigation 1	Issue Investigation 2	Issue Investigation 3
Students will organize their data to make a claim. Data from all three investigations will be used so that they have multiple pieces of evidence to support their claim.		

INFORMED ACTION

IDENTIFYING SOLUTIONS

How could you encourage your students to identify and explore a variety of solutions that could directly address the issue? How could students make decisions about which solution(s) to implement?

The students will investigate strategies that could be used by homeowners instead of pesticides and fertilizers. Students will also learn how the city might be able to mitigate sewage overflow during storms. They will use this research to recommend possible solutions.

DESIGNING A PLAN AND TAKING INFORMED ACTION

What resources or frameworks will students use to create their plan of environmental action? During what time period will they execute their action project?

Students will use their identified solutions to develop short media campaigns to make local residents aware of the problems and how to prevent them. The media selected can be posters (via Canva), blog posts, commercials.

The media campaigns will go through a revision process based on feedback from school representatives and local town representatives.

The teacher will contact VPM to see if Science Matters can showcase their campaigns.

EVALUATING ACTION

In what ways could students reflect on the action project and determine the extent to which it successfully addresses the issue?

Students will submit their journals for review by the teacher. Students will reflect on their action plan and the impact they have had on the local community. The students will identify next steps for future classes to consider.