

Environmental Literacy Model



Title	Stopping Stormwater - Mitigating Pollution at Hedgesville Elementary School
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School, District	Hedgesville Elementary School - Berkeley County Schools
Audience (grade, course)	1st and 2nd Grade Science

Curriculum Anchor

Defining the Learning Objectives and Curriculum Connection

Curriculum indicators, performance expectations, and/or learning objectives.

Children’s interest in environmental education starts at a very young age. As early as Kindergarten, students begin planting flowers for Mother’s Day or watching bean sprouts grow in bags on classroom windows. In West Virginia, more specific environmental standards begin to appear in 1st grade with identifying and being able to locate geographically important bodies of water and specific geographic features. Critical thinking growth is also encouraged through standards-based collaboration and problem solving in all grades. 2nd Grade standards specifically focus on plant growth and the importance of water to that growth. Those state learning standards along with an environmentally conscious group of children who were bothered by standing water and litter on the playground, and the amount of paper and cardboard waste in the school, set the stage for the Rain Garden installation and an Earth Day Recycled Materials Parade.

The focus on learning and both large projects started in the classrooms with children learning about being environmentally conscious and protecting our Earth and watersheds. The teaching team focused on reducing pollution at the school and one element of that is thinking about how we can reuse materials including commonly littered materials. Led by the school’s Art teacher, children created costumes from large cardboard boxes and recycled materials from around the building like water bottles, and unused school supplies.

This wonderful collaboration and learning experience began when students noticed litter and the waterlogged field while playing at their school during recess. Building upon this observation, students received educational lessons about watersheds, stormwater runoff, pollution, best management practices and rain gardens. The lessons build up to the installation of a rain garden and a celebratory Earth Day Parade!

West Virginia College & Career Readiness Standards – Grade 1

- ELA.1.32: Ask and answer questions about what a speaker says in order to gather additional information or clarify something that is not understood.
- S.K-2.ETS.1: Students will ask questions, make observations, and gather information about a situation people want to change to define a simple problem that can be solved through the development of a new or improved object or tool
- S.K-2.ETS.2: Students will develop a simple sketch, drawing, or physical model to illustrate how the shape of an object helps it function as needed to solve a given problem.
- SS.1.5: Students will collaborate to identify a community need, propose a variety of solutions and investigate how individuals could participate to solve the problem.
- SS.1.15: Students will locate and identify the following on a map: WV, USA, Geographic features (mountains, bodies of water)
- DSS.K-2.6: Develop academic motivation- participate in a variety of classroom experiences and tasks;

approach tasks and activities with flexibility, imagination, and inventiveness

West Virginia College & Career Readiness Standards – Grade 2

- ELA.2.32: Ask and answer questions about what a speaker says in order to gather additional information or clarify comprehension, gather additional information, or deepen understanding of a topic or issue.
- S.K-2.ETS.1: Students will ask questions, make observations, and gather information about a situation people want to change to define a simple problem that can be solved through the development of a new or improved object or tool
- S.K-2.ETS.2: Students will develop a simple sketch, drawing, or physical model to illustrate how the shape of an object helps it function as needed to solve a given problem.
- DSS.K-2.6: Develop academic motivation- participate in a variety of classroom experiences and tasks; approach tasks and activities with flexibility, imagination, and inventiveness

Learning Objectives

Lesson 1 Outcomes: *Students will understand...*

- that everyone lives in a watershed
- that water flows downhill
- that natural physical features, like mountains and hills, define watersheds
- that the Potomac River is within the Chesapeake Bay Watershed

Students will be able to...

- define a watershed
- investigate how water travels through a watershed
- locate local streams and rivers in the Chesapeake Bay

Lesson 2 Outcomes: *Students will understand...*

- that it is easy to cause pollution
- that pollution is harmful to animals
- that it is difficult to undo pollution
- that the ground acts like a filter to clean water
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Students will be able to...

- *define pollution and stormwater runoff*
- *investigate different materials that can pollute our rivers*
- *analyze methods of cleaning polluted waters*
- *locate areas of pollution within our community*

Lesson 3 Outcomes: *Students will understand...*

- *that they are designing their school rain garden*
- *that rain gardens collect water from the school's roofs or parking lots*
- *that their rain garden will keep pollution from the stream*

Students will be able to ...

- *define native plant and rain garden*
- *analyze the shape and location of the rain garden and the plants they will be installing*
- *design a rain garden with the characteristics necessary for it to function for stormwater management*
- *locate where water will be entering their rain garden during a storm*

Describing the Local Context

The life-relevant issue that will serve as the context for learning.

Stormwater runoff and non-point source pollution are prevalent issues facing the Chesapeake Bay watershed including our own school. Our frequently used track and field area is adjacent to an elevated high traffic local road. Stormwater from the road carries pollutants and litter downhill onto the school's campus resulting in a waterlogged and littered area. Students will observe these issues at Hedgesville Elementary School and will learn how human behaviors impact not only their community but those downstream of them.

Identifying the Driving Question

A broad, open-ended, life-relevant question that is based on the standards/learning objectives. Guides inquiry for the investigation(s), prompts the development of actionable claims.

Driving Question: What impact do humans have on our watershed and what can we do to improve any negative impacts?

Supporting Questions:

- What is a watershed? What watershed do we live in?
- How does water travel in a watershed?
- What are some ways humans negatively and positively impact a watershed?
- How is land used at and around our school?
- What is stormwater runoff?
- What are best management practices?
- How is the land being used at and around our school contributing to environmental issues?
- What can we implement to manage stormwater and how do those implementations function?
- What is a rain garden? What are the key features and how do they work?
- What can individuals do to improve the health of our watershed?

issue Investigation

Asking Questions, Defining Issues and Problems

Students define the issue, problem, or phenomenon to be investigated and develop supporting questions that are relevant for investigation.

Issue Investigation 1	Issue Investigation 2	Issue Investigation 3
<p>What is a watershed? How does water move through our community and school? What is carried by that water?</p>	<p>What are some of the ways that land is used in and around our school? In and around our homes? How does water move through those areas?</p>	<p>How do you protect a river or stream? What actions can people do in their communities to protect rivers and streams?</p>

Planning and Conducting Investigations

Students plan and conduct investigations and classroom activities (indoor and outdoor) that actively address students' supporting questions. Students collect data that will be used to inform actionable claims.

Issue Investigation 1	Issue Investigation 2	Issue Investigation 3
<p>Students explored watershed models (including non-point source pollution EnviroScape model) and maps to explore their watershed and understand how water moves through the landscape. Students also investigated their schoolyard for signs of stormwater runoff and non-point source pollution, indicating the track and field area as a clear indicator of these issues.</p>	<p>Students discussed ways in which land is used around the school, noting the consistent development in Berkeley County They identified patterns of land use and investigated pervious/impervious surfaces at their own schoolyard.</p>	<p>Speakers from Cacapon Institute provided presentations about Best Management Practices (BMPs) allowing for students to reflect on options for mitigating stormwater runoff and protecting rivers. Students designed/planned rain gardens that could be implemented at the school to address its stormwater runoff.</p>

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Issue Investigation ccon't.>		
<p>Analyzing and Interpreting Data Students analyze data through graphs, models, and other methods to reveal patterns and relationships. Students synthesize and apply evidence from their investigations to draw conclusions that address the supporting questions.</p>		
Issue Investigation 1	Issue Investigation 2	Issue Investigation 3
<p>Students modeled stormwater runoff and non-point source pollution using the EnviroScape model. They located instances of pollution, applied it to the model, and simulated stormwater runoff. They then made observations from the model and their own schoolyard investigation to locate areas of stormwater runoff and non-point source pollution at school.</p>	<p>Students repeated the stormwater runoff model but implemented BMPs and compared consequences of stormwater runoff once mitigation actions were enacted. Students determine the ratio of pervious and impervious surfaces on their campus.</p>	<p>Students compared possible solutions/BMPs they learned about and how they can protect waterways. They then designed a rain garden for the school with the appropriate attributes in mind (shape, soil, native plants, etc.) and considered plant design (height, color, tolerance to water, etc.).</p>
<p>Constructing and Communicating a Claim Students draw on the conclusions from their investigations to make a claim about the driving question and communicate these evidence-based claims to internal and/or external audiences.</p>		
Issue Investigation 1	Issue Investigation 2	Issue Investigation 3
<p>Students will make a claim about which areas at school and in the community are affecting local waterway (positively or negatively).</p>	<p>Students will make claims about the benefits of BMPs and where implementation may be successful at their school.</p>	<p>Students presented their rain garden designs to the class and made claims about their plan and its potential effectiveness at their school.</p>

Stewardship and Civic Action

Identifying Solutions

Students identify and explore solutions that directly address the problem, challenge, or opportunity reflected in their claim. Students use decisionmaking processes to identify the solution(s) to implement.

At this stage, students will have explored BMPs that help local waterways and rain garden design. Using resources from Chesapeake Bay Foundation, Chesapeake Bay Program, and local resources (such as guest speakers from Cacapon Institute, Potomac Valley Audubon Society, Berkeley County Public Service Sewer District, Master Naturalists, etc.), students will make claims about BMPs and their installation on the school's campus. They will also have made claims about the design and placement of their rain gardens.

Designing a Plan and Taking Informed Action

Students design a plan for implementing solutions through informed action in their classrooms, schools, and/or communities. The plans should include criteria for determining the extent to which the action successfully addresses the problem, challenge, or opportunity reflected in the claim. Students implement their plans.

Based on the claims made from the class, students will agree on a single solution that the entire class can participate in to mitigate stormwater runoff. In this case, it was decided that a rain garden would be installed. Then a plan would be developed about the design and organization of plants within the garden.

Evaluating Action

Students reflect on the action and determine the extent to which it successfully addresses the problem, challenge, or opportunity reflected in the claim. Students communicate their findings and share proposals for sustaining or extending the action.

After students have installed the rain garden, they will revisit the site and reflect on their solution. They will determine if the plan is effective, if it needs any maintenance, or if additional solutions need to be added. They also reported to the community about its installation in the local paper, in addition to their recycling campaign and reused materials parade.

Future plans to continue action is to have students develop content for signs that will be posted at the rain garden site. The plan to develop signage will aid in the garden's use as an outdoor learning space and will inform visitors about the purpose of the rain garden.