

## NGSS Connections

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Chesapeake Bay Critter Investigation

Grade Level: 3

**Performance Expectations:** Students’ ability to complete the following performance expectation(s) will be supported by participation in this activity.

**3-LS4-3:** Construct an argument with evidence that in a particular habitat some organisms can survive well, some survive less well, and some cannot survive at all.

Dimension	NGSS Code or citation	Corresponding student task in activity
<b>Disciplinary Core Idea</b>	LS2.C Ecosystem Dynamics, Functioning, and Resilience <ul style="list-style-type: none"> <li>• When the environment changes in ways that affect a place’s physical characteristics, temperature, or availability of resources, some organisms survive and reproduce, others move to new locations, yet others move into the transformed environment, and some die.</li> </ul>	<p>Students measure the temperature and salinity of the Inner Harbor’s water column at three different depths (1 m, 3 m, 5 m), then compare the biodiversity found on biodisks cultured at each of the three depths. They draw the connection between differences in the characteristics in different columns depths with the difference in organisms found there.</p> <p>Students answer the question of if and how the water quality characteristics measured might change over a day, season, year, and how the organisms living there might have to adjust.</p>
	LS4.C Adaptation <ul style="list-style-type: none"> <li>• For any particular environment, some kinds of organisms survive well, some survive less well, and some cannot survive at all.</li> </ul>	<p>Students measure the temperature and salinity of the Inner Harbor’s water column at three different depths (1 m, 3 m, 5 m), then compare the biodiversity found on biodisks cultured at each of the three depths. They draw the connection between differences in the characteristics in different columns depths with the</p>

		<p>difference in organisms found there, recognizing that at each depth, the water quality creates a habitat that supports some organisms but not others.</p>
	<p>LS4.D Biodiversity and Humans</p> <ul style="list-style-type: none"> <li>Populations live in a variety of habitats, and changes in those habitats affects the organisms living there.</li> </ul>	<p>Students collect data about water quality and biodiversity at three different depths of the Inner Harbor’s water column, then use that data as evidence to show that changes in the habitats affect the organisms living there.</p> <p>Students answer questions about whether the organisms living in the Inner Harbor are impacted by such system-wide impacts such as a heavy rainy season (high input of freshwater) or drought, or prolonged heat waves or deep freezes.</p>
<b>Practice</b>	<p>Planning and Carrying out Investigations</p> <ul style="list-style-type: none"> <li>Make observations and/or measurements to produce data to serve as the basis for evidence for an explanation of a phenomenon or test a design solution</li> <li>Make predictions about what would happen if a variable changes.</li> </ul>	<p>Students collect water quality and biodiversity data then use that to answer the scientific questions regarding biodiversity and differences at different levels in the water column.</p> <p>Students predict what would happen to the organisms living in the Inner Harbor if changes occur to their habitats such as changes in salinity or temperatures.</p>
	<p>Analyzing and Interpreting Data</p> <ul style="list-style-type: none"> <li>Analyze and interpret data to make sense of phenomena using logical reasoning, mathematics, and/or computation.</li> </ul>	<p>Students use data collected in their investigations to provide evidence for differences in biodiversity at different depths.</p>

	<ul style="list-style-type: none"> <li>Compare and contrast data collected by different groups in order to discuss similarities and differences in their findings.</li> </ul>	As class data is collected, students consider why different groups observing biodisks at the same depths might have different numbers of organisms recorded.
	<p>Constructing Explanations and Designing Solutions</p> <ul style="list-style-type: none"> <li>Construct an explanation of observed relationships.</li> <li>Use evidence (e.g., measurements, observations, patterns) to construct or support an explanation or design a solution to a problem.</li> </ul>	Students use data collected in lab as evidence to orally explain biodiversity at different water depths.
<b>Crosscutting Concept</b>	<p>Scale, Proportion, and quantity</p> <ul style="list-style-type: none"> <li>Phenomena that can be observed at one scale may not be observed at another scale.</li> </ul>	In some classes, students observe that the organisms on the biodisks are very different and much smaller than the organisms they observe casually walking along the harbor (i.e., we are observing very small organisms on the biodisks and the students consider larger organisms such as large fish and aquatic fowl).
	<p>Stability and Change of Systems</p> <ul style="list-style-type: none"> <li>Change is measured in terms of differences over time and may occur at different rates.</li> <li>Some systems appear stable, but over long periods of time will eventually change.</li> </ul>	Students consider how different parts of the watershed might alter the salinity and pH of the Inner Harbor's water. For example, a large storm runoff would likely reduce salinity while an extended drought might serve to increase salinity. This, in turn, changes living conditions for the organisms in the Inner Harbor.
<p><b><u>Nature of Science</u></b></p> <p>Scientific Knowledge is Based on Empirical Evidence</p> <ul style="list-style-type: none"> <li>Science knowledge is based upon logical and conceptual connections between evidence and explanations.</li> </ul> <p>Science is a Way of Knowing</p> <ul style="list-style-type: none"> <li>Science is both a body of knowledge and the processes and practices used to add to that body of knowledge.</li> <li>Science knowledge is cumulative and many people, from many generations and nations, have contributed to science knowledge.</li> </ul> <p>Science is a Human Endeavor</p> <ul style="list-style-type: none"> <li>Men and women from different social, cultural, and ethnic backgrounds work as scientists and engineers.</li> </ul>		
<p><b>Connections to <u>Common Core State Standards</u></b></p> <p><u>English Language Arts/Literacy</u></p>		

Grade 4

**Performance Expectations:** Students’ ability to complete the following performance expectation(s) will be supported by participation in this activity.

Dimension	NGSS Code or citation	Corresponding student task in activity
<b>Disciplinary Core Idea</b>		
<b>Practice</b>	Planning and Carrying out Investigations <ul style="list-style-type: none"> <li>• Make observations and/or measurements to produce data to serve as the basis for evidence for an explanation of a phenomenon or test a design solution</li> <li>• Make predictions about what would happen if a variable changes.</li> </ul>	Students collect water quality and biodiversity data then use that to answer the scientific questions regarding biodiversity and differences at different levels in the water column.  Students predict what would happen to the organisms living in the Inner Harbor if changes occur to their habitats such as changes in salinity or temperatures.
	Analyzing and Interpreting Data <ul style="list-style-type: none"> <li>• Analyze and interpret data to make sense of phenomena using logical reasoning, mathematics, and/or computation.</li> <li>• Compare and contrast data collected by different groups in order to discuss similarities and differences in their findings.</li> </ul>	Students use data collected in their investigations to provide evidence for differences in biodiversity at different depths.  As class data is collected, students consider why different groups observing biodisks at the same depths might have different numbers of organisms recorded.
	Constructing Explanations and Designing Solutions <ul style="list-style-type: none"> <li>• Construct an explanation of observed relationships.</li> </ul>	Students use data collected in lab as evidence to orally explain biodiversity at different water depths.

	<ul style="list-style-type: none"> <li>Use evidence (e.g., measurements, observations, patterns) to construct or support an explanation or design a solution to a problem.</li> </ul>	
<b>Crosscutting Concept</b>	<p>Scale, Proportion, and quantity</p> <ul style="list-style-type: none"> <li>Phenomena that can be observed at one scale may not be observed at another scale.</li> </ul>	In some classes, students observe that the organisms on the biodisks are very different and much smaller than the organisms they observe casually walking along the harbor (i.e., we are observing very small organisms on the biodisks and the students consider larger organisms such as large fish and aquatic fowl).
	<p>Stability and Change of Systems</p> <ul style="list-style-type: none"> <li>Change is measured in terms of differences over time and may occur at different rates.</li> <li>Some systems appear stable, but over long periods of time will eventually change.</li> </ul>	Students consider how different parts of the watershed might alter the salinity and pH of the Inner Harbor's water. For example, a large storm runoff would likely reduce salinity while an extended drought might serve to increase salinity. This, in turn, changes living conditions for the organisms in the Inner Harbor.
<p><b><u>Nature of Science</u></b></p> <p>Scientific Knowledge is Based on Empirical Evidence</p> <ul style="list-style-type: none"> <li>Science knowledge is based upon logical and conceptual connections between evidence and explanations.</li> </ul> <p>Science is a Way of Knowing</p> <ul style="list-style-type: none"> <li>Science is both a body of knowledge and the processes and practices used to add to that body of knowledge.</li> <li>Science knowledge is cumulative and many people, from many generations and nations, have contributed to science knowledge.</li> </ul> <p>Science is a Human Endeavor</p> <ul style="list-style-type: none"> <li>Men and women from different social, cultural, and ethnic backgrounds work as scientists and engineers.</li> </ul>		
<p><b><u>Connections to Common Core State Standards</u></b></p> <p><u>English Language Arts/Literacy</u></p>		

Grade 5

**Performance Expectations:** Students' ability to complete the following performance expectation(s) will be supported by participation in this activity.

Dimension	NGSS Code or citation	Corresponding student task in activity
<b>Disciplinary Core Idea</b>		
<b>Practice</b>	Planning and Carrying out Investigations <ul style="list-style-type: none"> <li>• Make observations and/or measurements to produce data to serve as the basis for evidence for an explanation of a phenomenon or test a design solution</li> <li>• Make predictions about what would happen if a variable changes.</li> </ul>	<p>Students collect water quality and biodiversity data then use that to answer the scientific questions regarding biodiversity and differences at different levels in the water column.</p> <p>Students predict what would happen to the organisms living in the Inner Harbor if changes occur to their habitats such as changes in salinity or temperatures.</p>
	Analyzing and Interpreting Data <ul style="list-style-type: none"> <li>• Analyze and interpret data to make sense of phenomena using logical reasoning, mathematics, and/or computation.</li> <li>• Compare and contrast data collected by different groups in order to discuss similarities and differences in their findings.</li> </ul>	<p>Students use data collected in their investigations to provide evidence for differences in biodiversity at different depths.</p> <p>As class data is collected, students consider why different groups observing biodisks at the same depths might have different numbers of organisms recorded.</p>
	Constructing Explanations and Designing Solutions <ul style="list-style-type: none"> <li>• Construct an explanation of observed relationships.</li> <li>• Use evidence (e.g., measurements, observations, patterns) to construct or support an explanation or design a solution to a problem.</li> </ul>	<p>Students use data collected in lab as evidence to orally explain biodiversity at different water depths.</p>
<b>Crosscutting Concept</b>	Scale, Proportion, and quantity <ul style="list-style-type: none"> <li>• Phenomena that can be observed at one scale may not be observed at another scale.</li> </ul>	<p>In some classes, students observe that the organisms on the biodisks are very different and much smaller than the organisms they observe casually walking along the harbor (i.e., we are observing very small organisms on</p>

		the biodisks and the students consider larger organisms such as large fish and aquatic fowl).
	<p>Stability and Change of Systems</p> <ul style="list-style-type: none"> <li>• Change is measured in terms of differences over time and may occur at different rates.</li> <li>• Some systems appear stable, but over long periods of time will eventually change.</li> </ul>	Students consider how different parts of the watershed might alter the salinity and pH of the Inner Harbor’s water. For example, a large storm runoff would likely reduce salinity while an extended drought might serve to increase salinity. This, in turn, changes living conditions for the organisms in the Inner Harbor.
<p><b><u>Nature of Science</u></b></p> <p>Scientific Knowledge is Based on Empirical Evidence</p> <ul style="list-style-type: none"> <li>• Science knowledge is based upon logical and conceptual connections between evidence and explanations.</li> </ul> <p>Science is a Way of Knowing</p> <ul style="list-style-type: none"> <li>• Science is both a body of knowledge and the processes and practices used to add to that body of knowledge.</li> <li>• Science knowledge is cumulative and many people, from many generations and nations, have contributed to science knowledge.</li> </ul> <p>Science is a Human Endeavor</p> <ul style="list-style-type: none"> <li>• Men and women from different social, cultural, and ethnic backgrounds work as scientists and engineers.</li> </ul>		
<p><b><u>Connections to Common Core State Standards</u></b></p> <p><u>English Language Arts/Literacy</u></p>		