

Monitoring Estuarine Water Quality– NGSS Alignment

This module was developed to build data literacy, engaging students in increasingly sophisticated modes of understanding and manipulation of data. It was completed prior to the release of the Next Generation Science Standards (NGSS)^{*} and has recently been adapted to incorporate some of the innovations described in the NGSS.

This document outlines the ways in which each level of the module provides learning experiences that engage students in the three dimensions of the NGSS Framework while building towards competency in targeted performance expectations. Note: this document identifies the specific practice, core idea and concept directly associated with a performance expectation (shown in parentheses in the tables) but also includes additional practices and concepts that can help students *build toward* a standard.

Performance Expectation – Middle School

Matter and Energy in Organisms and Ecosystems

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

Students build towards aspects of this performance expectation throughout all levels in this module. In Levels 4 and 5, students identify water quality patterns in data and make inferences about how changes to physical conditions in estuaries could impact the spawning migrations of fish (Levels 4-5).

^{*} NGSS Lead States. 2013. Next Generation Science Standards: For States, By States. Washington, DC: The National Academies Press. Next Generation Science Standards is a registered trademark of Achieve. Neither Achieve nor the lead states and partners that developed the Next Generation Science Standards was involved in the production of, and does not endorse, this product.

Science and Engineering Practices (SEPs)	Middle School SEP	How the SEP Is Addressed by the Module	Level				
			1	2	3	4	5
Analyzing and Interpreting Data	Use graphical displays of large data sets to identify temporal and spatial relationships. <i>Builds towards MS-LS-4</i>	Students obtain and evaluate water quality data from estuarine ecosystems to identify temporal variations and/or latitudinal patterns.	x	x	x	x	x
Engaging in Argument from Evidence	Construct an oral and written argument supported by empirical evidence and scientific reasoning to support or refute an explanation or a model for a phenomenon or a solution to a problem. (MS-LS2-4)	Students write a brief report supported by their data investigations that supports or disproves a hypothesis about salinity variations within an estuary.			x		
		Students use data to construct an argument that describes how changes in water quality conditions in estuaries may affect fish.				x	x
Obtaining, Evaluating, and Communicating Information	Communicate scientific and/or technical information (e.g. about a proposed object, tool, process, system) in writing and/or through oral presentations. <i>Builds towards MS-LS-4</i>	Students communicate scientific information about the suitability of water quality conditions for the survival and/or spawning migrations of fish.			x	x	x
Connections to the Nature of Science: Science Knowledge is Based on Empirical Evidence	Science disciplines share common rules of obtaining and evaluating empirical evidence. (MS-LS2-4)	Optionally, at any point in this module, students may reflect on real time data and the need for quality control measures and carefully reviewed data (see <i>Handbook</i> , pg 7).	x	x	x	x	x

Disciplinary Core Ideas (DCIs)	Middle School DCI	How the DCI Is Addressed by the Module	Level				
			1	2	3	4	5
Ecosystem Dynamics, Functioning, and Resilience	MS-LS2.C: Ecosystems are dynamic in nature; their characteristics can vary over time. Disruptions to any physical or biological component of an ecosystem can lead to shifts in all its populations. (MS-LS-4)	Students understand that estuaries are dynamic in nature. They understand how water quality parameters such as temperature, dissolved oxygen and salinity vary over time.	x	x	x	x	x
		Students understand that changes to the physical conditions in estuaries may affect fish.				x	x

Crosscutting Concepts (CCCs)	Middle School CCC	How the CCC Is Addressed by the Module	Level				
			1	2	3	4	5
Patterns	Graphs, charts, and images can be used to identify patterns in data. <i>Builds towards MS-LS-4</i>	Students use graphs of water quality data from estuarine ecosystems to identify temporal and/or spatial patterns in temperature, salinity, and dissolved oxygen.	x	x	x	x	x
Stability and Change	Small changes in one part of a system might cause large changes in another part. (MS-LS-4)	Students understand that changes in water quality conditions in an estuary can impact the survival and/or spawning migrations of fish.				x	x

