connecting SCIENCE ON A SPEHRE to classroom curriculum with
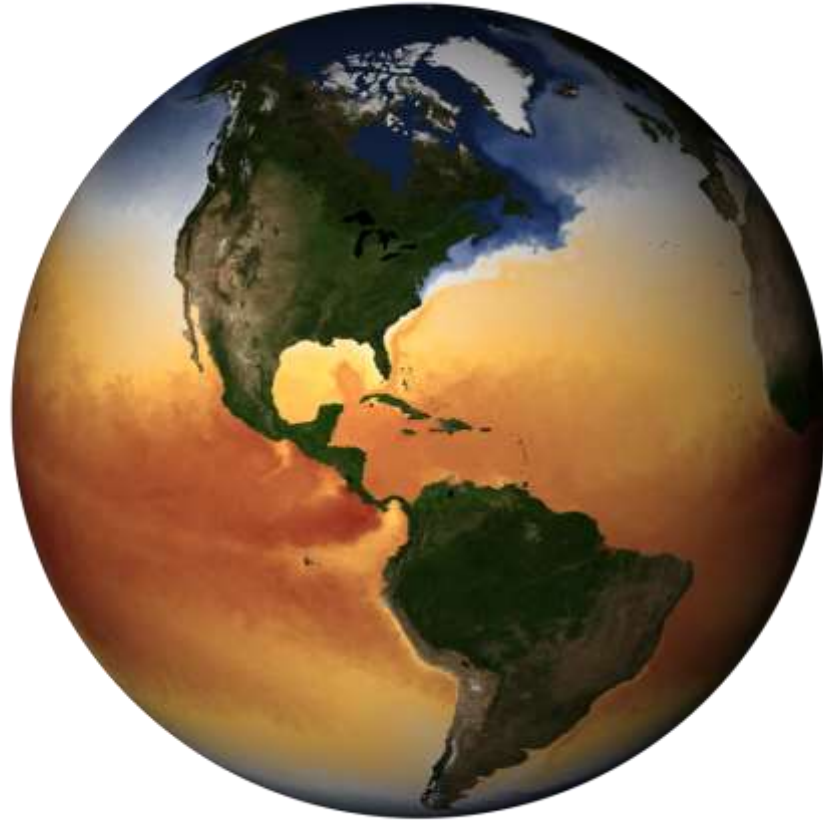# NOAA DATA IN THE CLASSROM

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Teaching environmental literacy through data literacy

El Nino

Sea Level

Water Quality

Coral Bleaching

Ocean Acidification

dataintheclassroom.noaa.gov

A CONSISTENT STRUCTURE TO EACH MODULE

pedagogical approach

Invention Level: Invention is the highest cognitive level. Exercises need to be designed where pedagogy and technology are integrated simultaneously. This is where the inquiry approach can be fully implemented. This area is very student driven.

Interactivity Level: This level features the use of complex technology interactions. Here problem-solving techniques are introduced that can be very student directed. Tools are needed for students to analyze data and discuss findings.

Adaptation Level: Students use portal tools to play and practice what they know. These interactions can be student-directed.

Adoption Level: Many teachers appreciate having prescriptive approaches to utilizing online tools. We recommend some form of drill and practice exercises that are predictable to teachers and will be available for them to share with their students. Once understood teachers can move to the next level of online interactivity and teacher technology inclusion.

Entry Level: The developers are making the basic assumption that first-time users of a new portal are at an entry level and need direct guidance in how to use the portal and demonstration site. This level of interaction is very teacher directed. Once teachers learn how to use the site they are ready to skip this level and move on to more complex levels. The Entry Level provides teachers with a teach-back system to help their students enter into the portal and its use.

Disciplinary Core Ideas (DCIs)	Middle School DCI	How the DCI Is Addressed by the Module	Level				
			1	2	3	4	5
Interdependent Relationships in Ecosystems	MS-LS2.A: Organisms, and populations of organisms, are dependent on their environmental interactions both with other living things and with nonliving factors. (MS-LS2-1)	Students will understand the relationships between upwelling, sea surface temperature and phytoplankton during El Niño and non-El Niño events.				x	
	MS-LS2.A: Growth of organisms and population increases are limited by access to resources. (MS-LS2-1)	Students analyze and interpret satellite data to provide evidence for the effects of disrupted upwelling on phytoplankton populations.				x	
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-LS2-4)	Teachers could slightly modify the activities in Level 4 to better address this DCI. For example, following data investigations, students could predict how disruptions to phytoplankton blooms impact the food web during El Niño.				x	
Weather and Climate	MS-ESS2.D: Weather and climate are influenced by interactions involving sunlight, the ocean, the atmosphere, ice, landforms, and living things. These interactions vary with latitude, altitude, and local and regional geography, all of which can affect oceanic and atmospheric flow patterns. (MS-ESS2.6)	Students will understand the changes that occur in the tropical Pacific Ocean as a result of the complex weather phenomenon, El Niño.		x		x	x

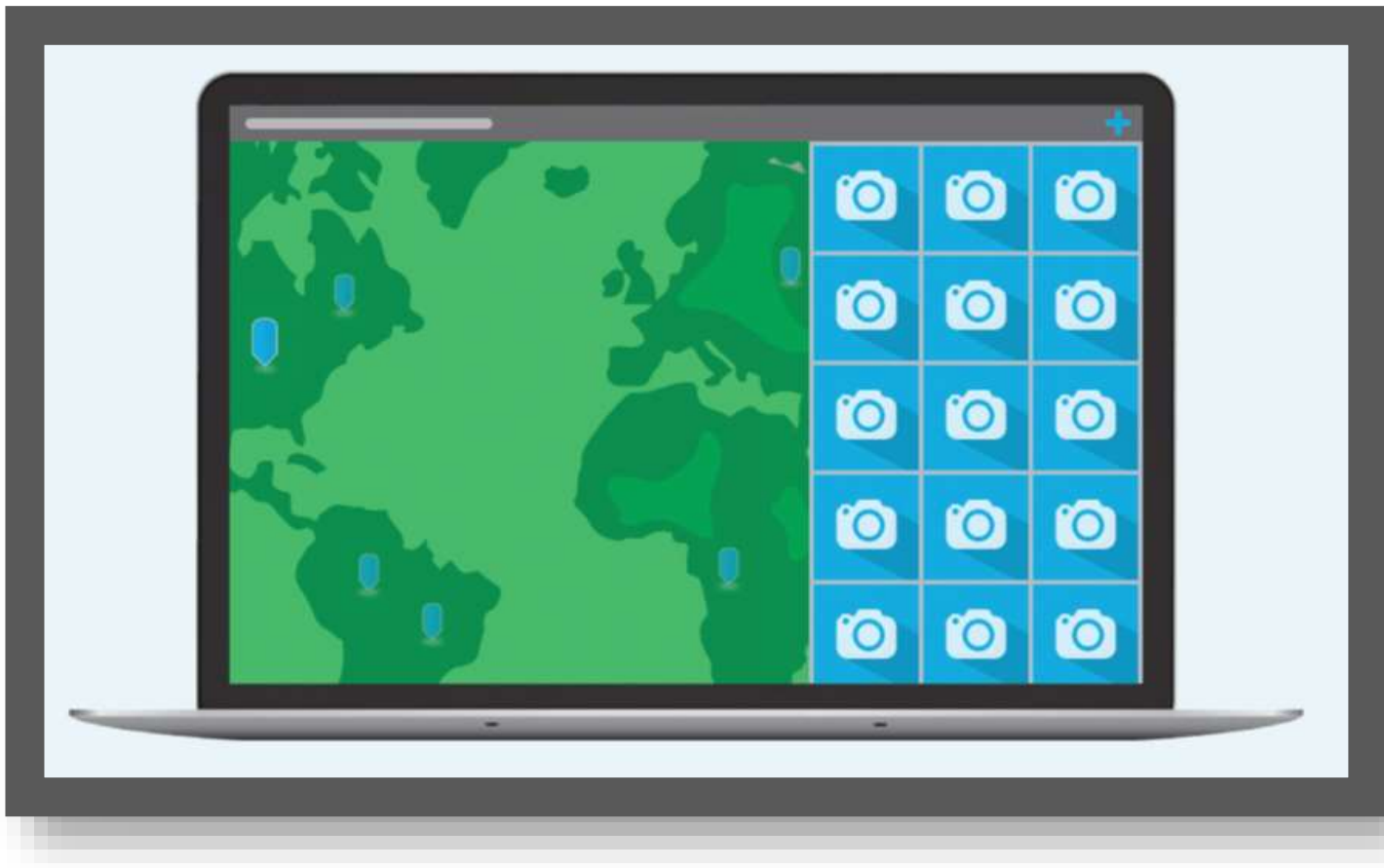| Crosscutting Concepts (CCCs)	Middle School CCC	How the CCC Is Addressed by the Module	Level				
			1	2	3	4	5
Patterns	Graphs, charts, and images can be used to identify patterns in data. Builds toward MS-ESS2-6, MS-LS2-1 & MS.LS2-4	Students use satellite maps and graphs to identify data patterns during El Niño and non-El Niño years.		x		x	x
	Patterns can be used to identify cause-and-effect relationships. Builds toward MS-LS2-4	Students investigate patterns between sea surface temperature and phytoplankton distribution to identify cause and effect relationships associated with El Niño.				x	
Cause and Effect	Cause and effect relationships may be used to predict phenomena in natural or designed systems. (MS-LS2-1)	Teachers could slightly modify the questions on the student worksheet to better address this concept.				x	
System and System Models	Systems may interact with other systems; they may have sub-systems and be a part of larger complex systems. (MS-ESS2-6)	Students understand that El Niño events are a result of interactions between the ocean and atmospheric systems in the tropical Pacific.		x		x	x
Stability and Change	Small changes in one part of a system might cause large changes in another part. (MS-LS2-4)	Students explain that changes that occur in the Pacific as a result of El Niño cause changes in upwelling systems and phytoplankton distributions.				x	

NGSS aligned

NOAA View

Science On a Sphere

Data in the Classroom

Esri StoryMaps

Build Web Map

GIS Data Search

Edit Elements

Map Embedded in Story Map

Data In The Classroom Demo

1. Website and Resources
2. Walking Through El Nino
3. Building a Module

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