Standards

All NODE modules follow guiding principles found in the Next Generation Science Standards (NGSS)* and Common Core State Standards**. They are based on the notion of learning as a developmental progression. Coral Bleaching activity levels are designed to address the NGSS and Common Core in the following ways:

Investigating Coral Bleaching Using Real Data

Performance Expectations

NGSS MS-LS2 Ecosystems: Interactions, Energy, and Dynamics

MS-LS2-1: Analyze and interpret data to provide evidence for the effects of resource availability on organisms and populations of organisms in an ecosystem.

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

Common Core ELA-Literacy: Science and Technical Subjects

RST.6-8.7: Integrate quantitative or technical information expressed in words in a text with a version of that information expressed visually (e.g., in a flowchart, diagram, model, graph, or table). Suggestion: Encourage students to synthesize information from data products generated online into their own representations (e.g. time series, charts comparing two locations, etc.).

Common Core ELA-Literacy: Writing

WHST.6-8.2 Write informative/explanatory texts, including the narration of historical events, scientific procedures/ experiments, or technical processes. Suggestion: Encourage students to document the research process in their own words.

WHST.6-8.7 Conduct short research projects to answer a question (including a self-generated question), drawing on several sources and generating additional related, focused questions that allow for multiple avenues of exploration. Suggestion: If students are having trouble formulating their own research questions, refer them to model questions used in earlier activities.

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* NGSS Lead States. 2013. Next Generation Science Standards: For States, By States. Washington, DC: The National Academies Press.
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** National Governors Association Center for Best Practices, Council of Chief State School Officers Title: Common Core State Standards. Publisher: National Governors Association Center for Best Practices, Council of Chief State School Officers, Washington D.C. Copyright Date: 2010.

Science and Engineering Practices	Disciplinary Core Ideas	Crosscutting Concepts
Analyzing and interpreting data: students read and interpret remote sensing data products (Levels 1 & 3); students interpret data from in-situ monitoring simulation (Level 2); students interpret data products generated to investigate a research question (Levels 4 & 5). **Developing and using models:** students engage in role play to model data gathering techniques for in-situ monitoring of corals (Level 2). **Using mathematics and computational thinking:** students develop a working definition of temperature "anomalies, and use a Degree Heating Week calculator to examine the relationship of derived DHW to satellite-collected sea surface temperature data (Level 3). **Constructing explanations and designing solutions:** students develop presentations to communicate findings from their data gathering (Levels 4 & 5). **Engaging in argument from evidence:** students present data in support of a research question (Levels 4 & 5). **Obtaining, evaluating, and communicating information:** students construct query to select and generate remote sensing data products (Levels 1 & 3); students record, evaluate, and report on findings from in-situ monitoring simulation (Level 2); students develop presentations to communicate findings from their data gathering (Levels 4 & 5). **Planning and carrying out investigations:** students design their own investigation using real data to try to answer a research question of their choosing (Level 5).	**LS2.A: Interdependent Relationships in Ecosystems:** students construct models to understand the symbiotic relationship of corals and zooxanthellae (Level 2) . **LS2.C: Ecosystem Dynamics, Functioning, and Resilience:** students examine evidence from in-situ coral monitoring to assess changes in the population over time (Level 2); students examine how temperature anomalies contribute to accumulated thermal stress in corals (Level 3); students generate data products to investigate whether ecosystem changes produce conditions for thermal stress at coral locations (Level 4); students design their own investigation using real data to to examine factors related to thermal stress in coral ecosystems (Level 5).	**Patterns:** Observed patterns of forms and events guide organization and classification, and prompt questions about relationships and the factors that influence them (Levels 1 & 2). **Systems and System Models:** Defining the system under study - specifying its boundaries and making explicit a model of that system - provides tools for understanding and testing ideas that are applicable throughout science and engineering (Level 3). **Scale, Proportion, and Quantity:** In considering phenomena, it is critical to recognize what is relevant at different measures of size, time, and energy and to recognize how changes in scale, proportion, or quantity affect a system's structure or performance (Level 4). **Stability and Change:** For natural and built systems alike, conditions of stability and determinants of rates of change or evolution of a system are critical elements of study (Level 5).