California Lutheran University
Graduate School of Education
Center for Innovative Learning

Synthetic Materials and How They Impact Marine Ecosystems

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1. Start with the standards

List the Performance Expectation(s) (a.k.a. PE's) that will be addressed:

MS-PS1-3 Gather and make sense of information to describe that synthetic materials come from natural resources and impact society.

MS-LS2-4. Construct an argument supported by empirical evidence that changes to physical or biological components of an ecosystem affect populations. [Clarification Statement: Emphasis is on recognizing patterns in data and making warranted inferences about changes in populations, and on evaluating empirical evidence supporting arguments about changes to ecosystems.]

MS-LS2-5 Evaluate competing design solutions for maintaining biodiversity and ecosystem services.

MS-ETS1-1. Define the criteria and constraints of a design problem with sufficient precision to ensure a successful solution, taking into account relevant scientific principles and potential impacts on people and the natural environment that may limit possible solutions.

MS-ETS1-2. Evaluate competing design solutions using a systematic process to determine how well they meet the criteria and constraints of the problem.

MS-ETS1-3. Analyze data from tests to determine similarities and differences among several design solutions to identify the best characteristics of each that can be combined into a new solution to better meet the criteria for success.

2. Focus on the big ideas

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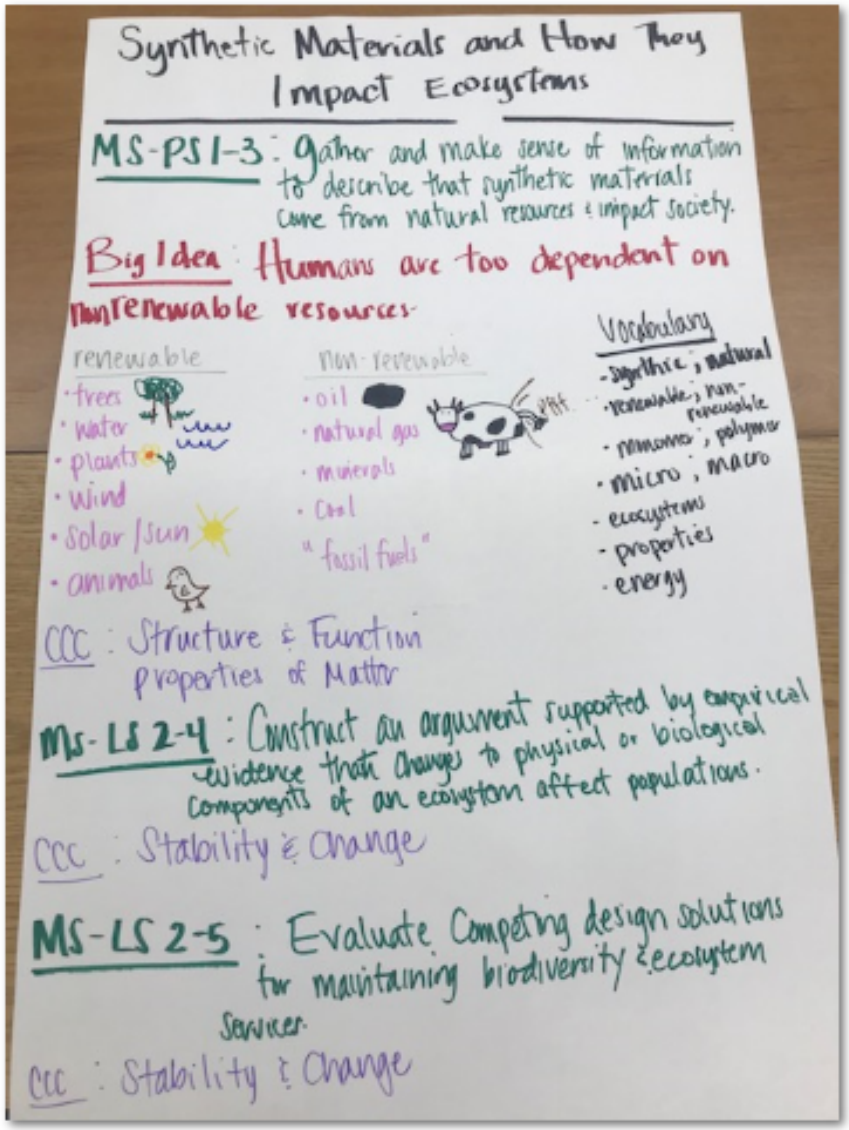
Make an Anchor Chart and/or an Ideal "Gotta Have" Checklist

Review the PE's, Clarification Statements, Assessment Boundaries, the DCIs, and CCC's from each standard. Create a Anchor Chart graphical display or checklist of the big science ideas and their connections students will learn in this instructional segment. Include icons/ graphics that students should use when modeling these concepts.

AAAS assessment topics may be helpful.

Insert a photo or drawing of your chart or your checklist to the right.

Anchor Chart:



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3. Connect the big ideas to locally relevant and relatable phenomena

Brainstorm Anchor and Investigative Phenomena	Anchor Phenomena (Engage): The Great American Garbage Patch Explore 1 Phenomena: Plastics all around us Explain 1 Phenomena: Any plastic object Explore 2 Phenomena: Liquid facial cleansers Explain 2 Phenomena: Mussel dissection Evaluate 1: Summative Assessment

Brainstorm a list of 5-8 phenomenon that will require synthesis of the big ideas from your anchor chart in order for students to construct a cohesive explanation that cannot be "googled".

Rank the phenomena considering criteria such as grade-level appropriateness, local relevancy, and connection to all of the identified big ideas in the anchor chart.

Use the top ranked phenomenon to anchor the instructional unit and create a need to know basis for learning all of the core science ideas from the anchor chart. The remaining phenomena may be used as investigative phenomena to drive learning of specific core ideas.

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4. Make explicit how students will demonstrate 3-dimensional mastery	
Evidence of Learning Examine the Evidence Statements for each PE in the unit. Create an exemplar student product or a rubric for one or more of the following that would demonstrate mastery of the standards in this instructional segment as they relate to the anchor phenomena: • ***Written Explanation*** • ***Model*** • ***Assessment*** Type, insert a picture, or insert a link to your mastery sample in the field to the right.	Students will understand that there are renewable resources that can be used in place of nonrenewable resources. Students will develop bioplastics. Students will create an advertisement or sales pitch to sell their bioplastic.. Students will write to a local business and use CER to convince the business to alter one of their practices in order to reduce the use of plastics.
5. Work backwards to map out the sequence in which the big ideas will be learned	
Plan out the sequence of how you will teach the big science ideas in this instructional segment. Create a flowchart or write out the sequence in which the core ideas from the anchor chart logically build in order to help students make sense of the anchor phenomenon and answer the driving question.	

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6. Use the 5E Model to structure the instructional segment	
Create one or more 5E Sequence Review the 5E Format and these example 5E sequences (food web narrative, plate tectonics chart). Then use this blank form to create your own 5E to address each of the big ideas on your anchor chart, starting with your anchor phenomena and building to students evaluation of their own mastery as you have defined it in part 4. For each of the 5E's provide a time estimate, a description of what students will be doing, and references for any external lessons or resources. Insert a link to your 5E sequence(s) in the field to the right.	5E Plan (Click to see the full daily plan) Engage: Where Does Our Trash Go? Explore 1: Surrounded by Plastic Explain 1: Plastic Problem Explore 2: What's in Your Soap? Explain 2: Small Plastics, Big Problem Elaborate 1: Bioplastics Engineering Challenge Evaluate 1: Summative Assessment Link: MS-PS1-3/MS-LS2-4&5

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