

A Missing Limb	
Course: Marine Science 101 – Unit 5	Date:
<p>Problem: Develop a prosthetic limb for a mature female green sea turtle.</p> <p>Details: A fully-grown female green sea turtle (<i>Chelonia mydas</i>) has lost her back right flipper; all that remains is the skin-covered stub of the femur. This appendage is not only used for swimming, but is an important tool for excavating sand during nesting season. The prosthesis must mimic the natural maneuverability (i.e. rigid enough to swim, paddle and steer, but flexible enough to scoop sand) and load bearing capabilities of the left flipper.</p> <p><i>Note:</i> The Anatomy of Sea Turtles by Dr. Jeanette Wyneken is a free online resource.</p>	
<p>Brainstorm: <i>What are events or issues that align with the content I'm teaching (based on the standards)?</i></p> <p>What is the physiological importance of the flipper? What is the ecological importance of the green turtle? What purpose do models have in science and medicine?</p>	
Learning Goal(s):	<p><i>Students understand that...</i></p> <ol style="list-style-type: none"> 1. Models are a key part to scientific inquiry. 2. Through evolution reptiles have a similar limb structure as mammals. 3. Green sea turtles play an important role in the marine ecosystem.
<p>Driving Question: <i>What are some examples?</i></p>	<p>What are the physiological properties of the flipper? How is a sea turtle flipper like their arm and hand? What articulations must the flipper be capable of doing? Why is it important that a mature female green turtle have a functioning rear flipper? What role do green turtles play in the marine ecosystem?</p>
<p>Inquiry Process/Research and Investigation Plan: <i>What are necessary steps for students to plan for and ensure their research and/or investigation is thorough and reliable?</i></p>	
<ol style="list-style-type: none"> 1. Identify student groups of three to four. 2. Using the student template provided, research green sea turtles. 3. Design and illustrate a prototype prosthetic flipper. 4. Present the prototype. 5. As each group presents, record in your science notebook key ideas. Ask questions regarding their proposal. Each group should accept critiques and criticism of their prototype for possible improvement. 6. Fabricate and modify the prototype. 	
<p>Formative Assessment and Feedback: <i>Identify when and how formative assessment will occur.</i></p>	
<i>Student</i>	<i>Instructor</i>

1. Research green sea turtles. 2. Identify rear flipper prototype. 2. Presentation. Provide feedback to peer groups. 3. Prototype fabrication and modification.		1. Identify dates for group progress review as well as research and final product goals.	
Summative assessment: <i>Identify what summative assessment will be and when it will occur. Identify how will it be assessed.</i> <ul style="list-style-type: none"> Final group fabrication of prosthesis or initial prototype design. 			
Revision: <i>Identify opportunities for revision based on formative assessment feedback.</i> <ol style="list-style-type: none"> Address feedback and provide clarification and revisions as needed. 			
Communication: <i>How will students communicate their learning?</i>			
Purpose To develop a prosthetic rear flipper for a mature female green sea turtle.	Audience Peers.	Presentation Type Informal presentation with peers.	Impact Engineering an artificial limb for a sea turtle.
Standards: All Content Areas <i>Not all will always apply</i>			
English-Language Arts	ELA-Literacy.RST.11-12.7 Integrate and evaluate multiple sources of information presented in diverse formats and media (e.g., quantitative data, video, multimedia) in order to address a question or solve a problem. ELA-Literacy.SL.11-12.1B Work with peers to promote civil, democratic discussions and decision-making, set clear goals and deadlines, and establish individual roles as needed. ELA-LITERACY.SL.11-12.1.C Propel conversations by posing and responding to questions that probe reasoning and evidence; ensure a hearing for a full range of positions on a topic or issue; clarify, verify, or challenge ideas and conclusions; and promote divergent and creative perspectives. ELA-LITERACY.SL.11-12.5 Make strategic use of digital media (e.g., textual, graphical, audio, visual, and interactive elements) in presentations to enhance understanding of findings, reasoning, and evidence and to add interest.		
Mathematics	MP.4 Model with mathematics.		
Science	Disciplinary Core Ideas <i>Natural Selection and Evolution</i> LS4.A Evidence of Common Ancestry and Diversity LS4.C Adaptation	Science & Engineering Practices Developing and Using Models	Crosscutting Concepts Cause and Effect Systems and System Models

		Planning and Carrying Out Investigations	
History			
Arts/ Technology/ PE/Languages			