Plant and Animal Structures Lesson 3: "The Engineer"

Student Handout

Your Challenge: Plants and Animals have unique structures used to help them grow, develop, survive and reproduce. You have been hired by Biomimicry Institute as a product researcher and developer. Your job is to study specific plant and animal structures and their functions in order to inspire an invention that mimics a plant or animal structure but can solve a human problem.

Directions:

1. Get Inspired! Explore the plant and animal cards below taking note of the unique structures that make up the organisms.
2. Choose one species you'd like to focus your design on.
3. Start planning! Complete your research and development chart.
4. Finalize your prototype design and add labels that describe the function of its key features for solving your chosen problem.
5. Build your device using materials approved by your teacher.
6. Present your Biomimicry Device! To assist with your presentation, develop a poster for your Biomimicry prototype design. Include the following information:
    - A title with a creative name
    - A drawing, including labels and a description of the plant or animal structure used to inspire your product
    - A technical drawing, including labels and description of your product and how the design mimics a plant or animal structure
    - How the product will be used to solve a current human problem.

Planning Organizer:

What plant or animal will you be focusing on for your product?

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What structure of the animal or plant above will you be focusing on? **How is this structure used for survival, growth or reproduction?**	
Key Structure of Plant or Animal Species	How structure is used in survival

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Brainstorm: What types of human problems could be solved by creating a product that mimics the structure of your selected plant or animal?

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From your list of problems, choose one for which you will develop a product. Record the chosen problem here:

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Brainstorm some ideas for product designs that could solve your human problem above. Remember that the product/device must mimic the plant or animal structure(s) researched. Label the key parts on any sketches you make.

From your product development ideas, choose one idea that you will develop further. This will become your final product. On your sketch below, label the function of each part of your structural design.

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<table>
<tr><td colspan="3">Build your Prototype</td></tr>
<tr><td colspan="2">1. Identify Materials and explain their representation

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•</td><td>Teacher Approval Stamp</td></tr>
<tr><td colspan="3">2. Construct: Your teacher will specify the amount of “build time.”</td></tr>
<tr><td>3. Test Prototype:</td><td>Plan your test:

a. What will you test?

b. How will you test it? Write a summary of your procedure.

c. What do you expect to happen? Make a prediction.</td><td>Test your prototype. Record your observations here:</td></tr>
<tr><td>4. Make Modifications</td><td colspan="2">What will you change based on test observations and why? Your teacher will specify the amount of “build time” for modification.</td></tr>
<tr><td>5. Present your final design</td><td colspan="2">*Use Plant and Animal Structure Engineer Checklist to meet all requirements</td></tr>
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Assessment: Final Presentation

Let's get ready to present all of your great work! On a separate sheet of poster paper, draw diagrams that show your thinking as you engineered a product that is inspired by a plant or animal structure and designed to benefit a human client. Use the checklist and Science & Engineering Practices rubric to ensure you have addressed all aspects of the "Engineer" with quality work.

<u>Plant and Animal Structures Engineer Checklist: Content Concepts and Practices</u>

Biomimicry Device:

- ❏ Device clearly and accurately "mimics" the properties of the plant or animal structure chosen
- ❏ Device is built according to prototype design plans, using appropriate materials
- ❏ Device functions to solve the human problem of interest

Presentation Poster Requirements:

- ❏ Clear and creative title
- ❏ Includes a drawing of the organism from which the focus structure originated
  - ❏ Label the organism AND
  - ❏ Label the structures
  - ❏ Includes a caption that explains the function of the plant or animal structure chosen and how it helps the organism survive
- ❏ Includes a technical diagram of the Biomimicry product/device design
  - ❏ Labels are included to explain parts of the product/device and how it works
  - ❏ Include a caption to explain how the product/device mimics a plant or animal structure
  - ❏ Include a caption to explain how the product benefits the human client
- ❏ Diagrams and captions are arranged in a logical order
- ❏ Presentation poster is neat and in color

Science & Engineering Practices Assessed

	Emerging (1)	Developing (2)	Proficient (3)	Advanced (4)
Designing Solutions	Applies no scientific principles and/or data to design, construct, and/or test a design of an object, tool, process or system.	Applies minimal scientific principles and/or data to design, construct, and/or test a design of an object, tool, process or system.	Applies adequate scientific principles and/or data to design, construct, and/or test a design of an object, tool, process or system.	Applies complete scientific principles and/or data to design, construct, and/or test a design of an object, tool, process or system.
Communicating Findings/Design (Oral Presentation)	Findings/Design are incompletely and inaccurately communicated. Or no evidence of using appropriate eye contact, adequate volume, or clear pronunciation.	Findings/Design are completely communicated with some misconceptions. Or Uses minimal eye contact, inappropriate volume, or inconsistent pronunciation.	Findings are completely communicated but lack depth. Or often uses eye contact and engaging and appropriate volume and pronunciation, but is inconsistent.	Findings/Design are completely communicated with depth and complexity. Or mostly uses eye contact and engaging and appropriate volume and pronunciation.