

7.0.S Task Card: Building a Flashlight (Print 2 copies and place in plastic sleeves)

Guiding Question: How can failure lead to innovation?

Introduction

Have you ever used a flashlight? Have you ever wondered what the engineers needed to think about in order to build a device that shines light? Throughout the year you will be asked to think and work like an engineer to design and build different types of things to solve a specific problem.

Task: Build a flashlight prototype that meets the needs of your client and develop a model tracking the flow of energy in your prototype.

Time: 47-minutes

Materials: (per group) <ul style="list-style-type: none">• 2 - D batteries• 2 - 5" piece of copper insulated wire with ends stripped• 1- toilet paper roll• 1 - light bulb• 2 - brass fastner	<ul style="list-style-type: none">• 1 - 1" x 3" cardboard strip• 1 - paper clip• 1 - 5" of masking tape• additional supplies for constraints i.e. different size or amount of batteries, wires, light bulbs, cups• <u>Client's constraint cards</u>
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Procedure:

1. Use the Quiet Brainstorm & Academic Discussion Scaffolds to create a model of a flashlight given your client's specific constraints (20-minutes)
2. Building a Prototype (15-minutes)
3. Prototype Analysis (5-minutes)
 - a. As a class, record observations in the data table and analyze each prototype.

Flashlight Prototype Evaluation Criteria	
Materials	The materials you use is based on your client's constraints
Test	Does the prototype meet the needs of your client?

Reflection: (10-minutes)

Teamwork

- Complete the Collaboration and Teamwork Rubric.
- As a team, be prepared to share your team's thinking and decision-making process.

Individual Reflective Questions

Answer the following questions individually in your notebook.

1. What were the main structural features of your prototype? How did your team decide on these features?

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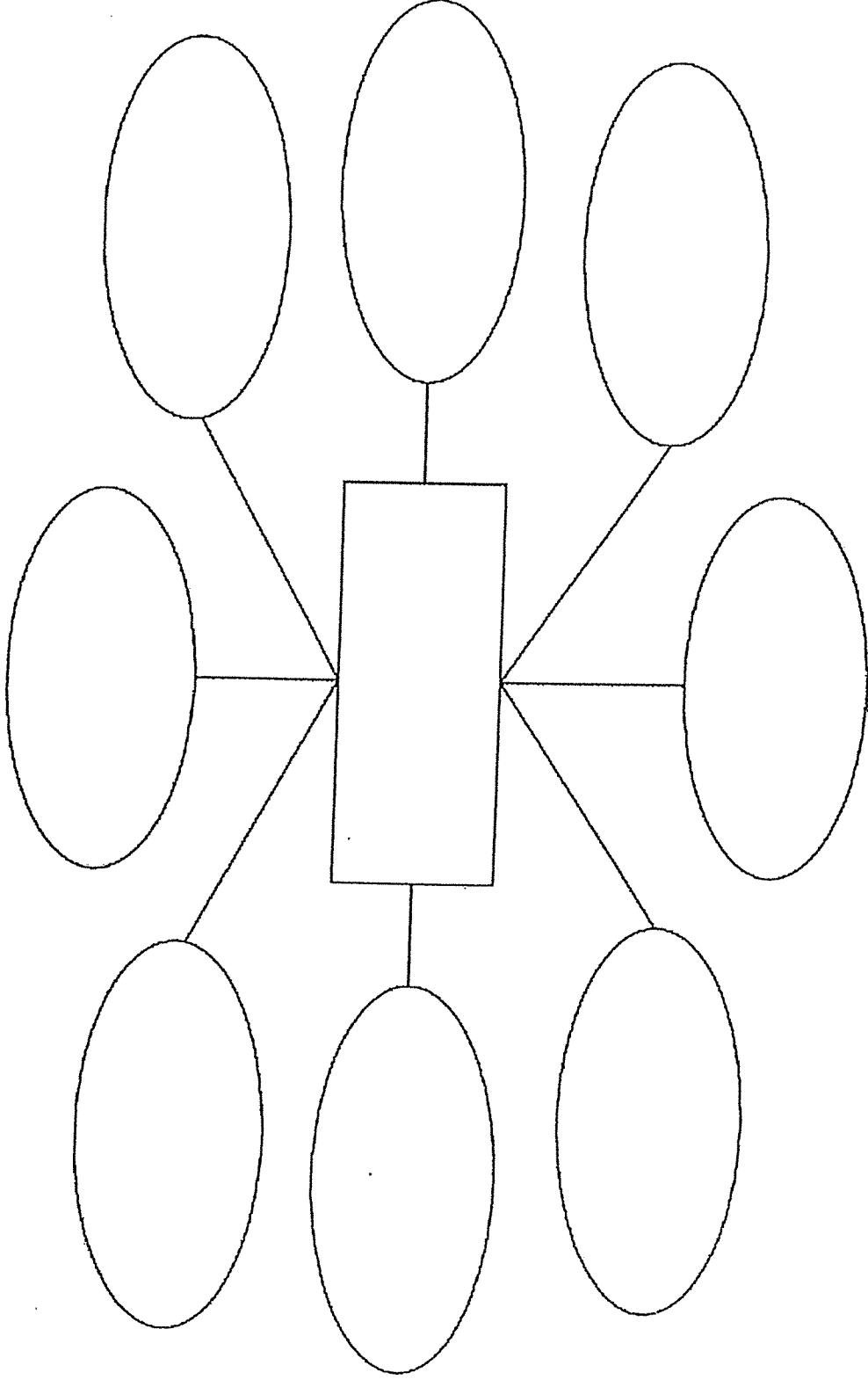
2. How could you improve the design of your prototype?
3. What previous science knowledge or experiences did you use to design and build your prototype? Explain how your knowledge or previous experiences helped you to design and build your prototype.
4. What were some of the strengths of working together as engineers for the task? What are some areas that your team needs to improve when you work on the next task together?

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Client Constraints (Cut these out)

Make your flashlight brighter	Make your flashlight weigh less	Make a flashlight with the fewest materials	Make a flashlight with a narrow beam of light
Make your flashlight brighter	Make your flashlight weigh less	Make a flashlight with the fewest materials	Make a flashlight with a narrow beam of light

Concept Web Templates and Examples



Reaction Symbols:
X = Know something about topic
? = Know little about topic

Performance Criteria/Rubric for Final Assessment				Points Possible	Self Score	Teacher Score
Construct a detailed diagram that shows structure and function in a lander design.				4		
Analyze your detailed diagram with one structural change from the original lander that demonstrates cause and effect.				4		
Construct an argument that explains how failure leads to innovation.				4		
Construct a prototype that meets all the dimension and weight constraints.				4		

Teamwork Rubric Self-Assessment					3	2	1	0
<u>Focused Completion of Task</u>								
Consistently and actively works towards the completion of team's goals and assigned work. Identifies changes when needed and encourages group action for change.								
<u>Consideration of Others</u>								
Shows sensitivity to the feelings and needs of others. The team values each other's ideas, knowledge, opinions, and skills through active listening. Everyone is encouraged to participate.								
<u>Contribution of Knowledge and Ideas</u>								
Everyone actively and consistently contributes knowledge, opinions, and skills without having to be reminded.								