

## Challenge Question or Problem to be Solved

### Challenge question or problem to be solved:

Students will apply the Engineering Design Process to design and build a car door panel using everyday materials to demonstrate their understanding of form, function, and aesthetics.

### Overall Expectations:

- A1. Initiating and Planning - demonstrate an understanding of fundamental technological concepts and related skills by initiating and planning projects
- A2. Designing and Performing - develop projects that involve creating products and/or services, using a variety of resources and techniques, and record the development of their projects
- A3. Analyzing and Refining - evaluate and refine processes, products, and/or services
- A4. Following Health and Safety Practices - apply an understanding of health and safety practices and procedures when using materials, tools, and equipment.
- B2. Impacts of Technology - analyze impacts of various technologies on individuals, society, the economy, and the environment



### Materials and Constraints:

- A car door panel that contains the required elements (lock, window controls, storage, handles)
- A car door panel that is aesthetically pleasing

Decorative options depend on budget, materials, and classroom space available to be provided by school.

Options available if autobody is not a classroom available:

- This project could be completed via virtual reality if available
- This project could be completed using cardboard and other recycled materials as a prototype



## UNDERSTAND THE PROBLEM/CHALLENGE

- Ask questions to clearly define the design challenge and constraints. Research similar products to gain understanding and knowledge.
- Ask questions to people who might use the product or service to understand their needs.

What is the design problem criteria you need to know?

How would you design a car door panel that is both functional and aesthetically pleasing? Introduce the concept of the door panel as a key component of a car's interior. Discuss its function: it holds the window controls, handles, and storage areas, while also contributing to the car's overall look.

What are the constraints your potential solutions must include? (Cost, material, size, safety etc)

Decorative options depend on budget and materials available to be provided by school.

What fundamental concepts must you consider when developing solutions?

Students will apply the engineering design process to design and create a model of a car door panel using simple materials, demonstrating their understanding of form, function, and aesthetics.

### Fundamental Concepts

<b>Aesthetics</b>	<b>Ergonomics</b>	<b>Material</b>	<b>Control</b>
<b>Safety</b>	<b>Creation</b>	<b>Mechanism</b>	<b>Structure</b>
<b>Environmental Sustainability</b>	<b>Function</b>	<b>Power &amp; Energy</b>	<b>Systems</b>
	<b>Innovation</b>		



## UNDERSTAND THE PROBLEM/CHALLENGE

- Ask questions to clearly define the design challenge and constraints. Research similar products to gain understanding and knowledge.
- Ask questions to people who might use the product or service to understand their needs.

What are the end-users' needs?

- A car door panel that contains the required elements (lock, window controls, storage, handles)
  
- A car door panel that is aesthetically pleasing

What products exist that can help guide your understanding for a solution? Use Reverse Engineering to help you develop potential solutions.

Think of the current design of many car door panels. What features are beneficial? What features are unnecessary or inefficient?



## GENERATE POTENTIAL SOLUTIONS

- Create a variety of possible solutions to meet the outlined constraints and fundamental concepts
- Analyse the solutions to choose the most appropriate one to develop further by using the end-users needs as consideration.

Concept #1	Concept #2
Concept #3	Concept #4



## GENERATE POTENTIAL SOLUTIONS

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Concept 1		Concept 2	
<b>Pros</b> <ul style="list-style-type: none"><li>•</li><li>•</li><li>•</li><li>•</li></ul>	<b>Cons</b> <ul style="list-style-type: none"><li>•</li><li>•</li><li>•</li><li>•</li></ul>	<b>Pros</b> <ul style="list-style-type: none"><li>•</li><li>•</li><li>•</li><li>•</li></ul>	<b>Cons</b> <ul style="list-style-type: none"><li>•</li><li>•</li><li>•</li><li>•</li></ul>



### PLAN THE PROTOTYPE DETAILS

- Add details such as: parts list, materials and tools required, process, overall dimensions and safety considerations.
- Create a schedule to manage each activity and your time for success.

#### Material required or supplied

Material	Size
1 Cardboard/foam board	
2 Scissors, tape, ruler, glue gun, glue sticks	
4 Markers or coloured pencils	
5 Timer	
6 Small buttons or beads (for handles, buttons, or other details)	
7 Pencil and paper	
8 Stamps or printed images for texture (optional)	

#### Tools required or supplied

1 Glue gun	6
2	7
3	8
4	9

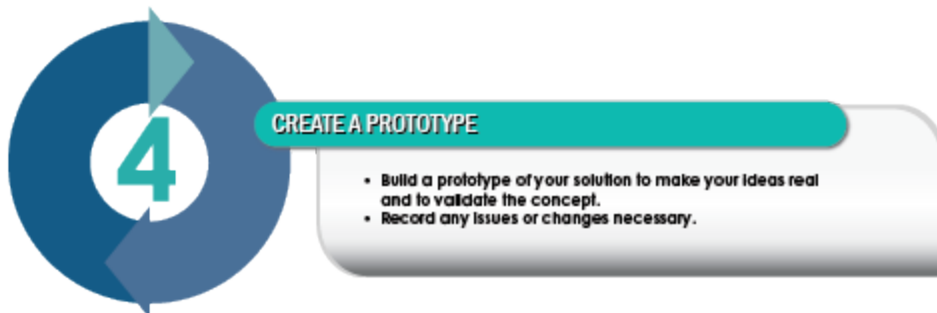


### PLAN THE PROTOTYPE DETAILS

- Add details such as: parts list, materials and tools required, process, overall dimensions and safety considerations.
- Create a schedule to manage each activity and your time for success.

List all **safety** and other **fundamental concepts** that need to be considered when working with the tools, chemicals or other materials for this project

Tool / Chemical	Safety Consideration:	Fundamental concepts - how are they considered?
1 Glue gun	Students must take care to not touch the metal tip when glue gun is hot	
2		
3		
4		
5		



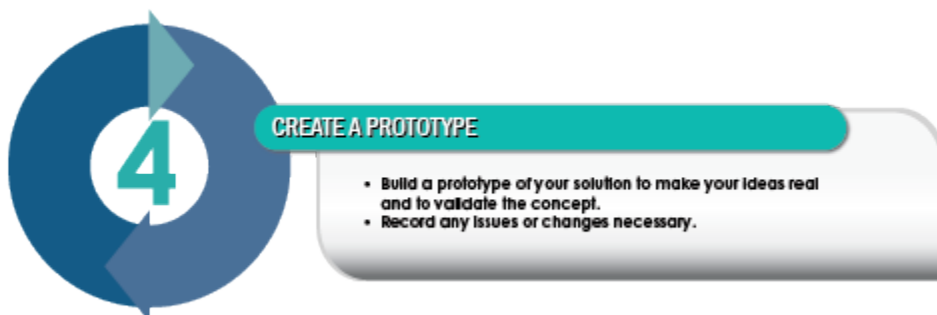
**4** CREATE A PROTOTYPE

- Build a prototype of your solution to make your ideas real and to validate the concept.
- Record any issues or changes necessary.

### Plan the Prototype Details

List all safety considerations that need to be considered when working with the tools, chemicals or other materials for this project.

Tool / Chemical	Safety Consideration:
1 Glue gun	Students must take care to not touch the metal tip when glue gun is hot.
2	
3	
4	
5	



**4** CREATE A PROTOTYPE

- Build a prototype of your solution to make your ideas real and to validate the concept.
- Record any issues or changes necessary.



Create a physical/computer model of the chosen design solution to verify the functionality and feasibility of the concept. Consider which type of prototype will work best for your project?

- A marketing campaign or information session
- Cardboard model



**Assess your working prototype in one of the following ways:**

1. Test and collect data.
2. Assess if the prototype meets the specified criteria from step 1
3. Get user feedback. Ask Questions like:
  - Does it work like it is supposed to?
  - Does it meet the end-users needs?
  - Is it safe to use?
  - What would you change? Why?
  - What might you add or take away?
  - What other thoughts do you have now?



### REFINE AND IMPROVE

- Review feedback and analyze data to make improvement.
- Iterate your first chosen solution to incorporate the observations and evidence gathered.

How can you improve your design?

Use testing, feedback, conversations and observations to guide iterative improvements. Here is an example of how you can document changes.

Duplicate as needed

<p>Design issue:</p>          <p>Details of possible improvements:</p>	<p>Add image or sketch of potential improvement:</p>
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