FROM IDEA TO PRODUCTION | TRANSPORTATION DESIGN
GRADES 9-12 TEACHER RESOURCE

Donald Hood (American, 1934–2018). '*71 Barracuda Front End Facelift Concept*, 1968. Crayon, gouache, ink, felt marker, prismacolor, pastel on vellum; 20 1/4 × 26 7/8 inches (51.4 × 68.3 cm). Collection of Robert L. Edwards and Julie Hyde-Edwards.

This lesson supports the special exhibition *Detroit Style: Car Design in the Motor City, 1950–2020*.

LEARNING TARGET

Through a variety of experiences, students will be able to develop an understanding of Transportation Design and the Design Thinking Process. Students will utilize STEAM concepts to produce a car prototype, work collaboratively, and adapt their thinking based on mathematical data. In creating a marketable product for a target audience, students must consider form and function as well as trends in design and their historical influences.

ESSENTIAL QUESTIONS

- How is a **prototype** developed?
- How does a creative idea become a reality?

STUDENT OUTCOMES | STUDENTS WILL

- create a functional vehicle prototype.
- analyze how the body, front, and rear axles work together to create a forward-moving object.
- identify the effects of force, motion, and speed.
- describe the evolution of American Transportation Design through the decades 1950-2020.
- determine how line, shape, color, and texture affect the functionality and marketability of a vehicle.
- collaborate with a team to adapt an idea under challenging constraints.
- synthesize the ideas of functionality and style to create a marketable vehicle.
- analyze mathematical data to adapt design results.

MICHIGAN VPAA STANDARDS

Perform

ART.VA.I.HS.1 Apply Acquired knowledge and skills to the creative problem-solving process.

Create

ART.VA.II. HS.1 Identify, define problems, and reflect upon possible visual solutions.

ART. VA.II.HS.7 Create collaboratively to resolve visual problems.

Analyze in Context

ART.VA.IV.HS.1 Observe and describe artwork with respect to history and culture.

ART.VA.V.HS.5 Recognize the role of art across the academic curriculum.

ART.VA.V.HS.6 Understand artistic knowledge as an important tool for successful living in the 21st century.

21ST CENTURY LEARNING SKILLS ALIGNMENT

Collaboration

Critical Thinking

Flexibility

Information Literacy

PRE-VISIT ACTIVITIES

DAY 1

1. Introduce students to Career Pathways by showing them a short video about Industrial Designers from the U.S. Bureau of Labor Statistics.
2. Invite students to discuss both engineering and creative occupations. (See **Additional Teaching Resources** on page 5 for more Career Pathway information). Ask students to consider:
   - How might these two occupations work together?
   - Do you think it takes both types of careers (and people) to create a successful transportation design?
3. Introduce students to new vocabulary, located in "**From Idea to Production - Student Packet**." It is important that students explore these new concepts prior to beginning this lesson.

Divide students into groups or 3 or 4 to promote collaboration as a design team.

4. Hand out **"From Idea to Production - Student Packet"** to students. This document is a step-by-step guide for the entire lesson. Draw student's attention to **Step 10: Grading Rubric** and encourage teams to self-assess throughout the project.
5. Provide students with the list of prototype car building materials. As a team, they will review the materials and the building instructions. Explain the concept of a *prototype.* Tell students that they will be following the step-by-step instructions to build a functional car *prototype*, also known as a "base model."

DAYS 2 AND 3

Once each team has had the opportunity to peruse the "**From Idea to Production - Student Packet,**" instruct students to construct the *prototype*, using the step-by-step guide "**How to Create a Base Model Rubber Band Car."**

DAY 4

1. After their *prototype* is built, explain to students that they will now race their car against the cars of other teams.
2. Next, students will calculate their average speed and compare their car's performance against the class average. Direct students to **Step 4: Calculating Speed and Recording Data,** located in the **"From Idea to Production - Student Packet,**" to record their performance.

3. Encourage students to discuss the design process and what affected the performance of their functional *prototype* vehicle.
4. As they continue their journey through the *Design Thinking* process, students will reflect on the results of their race. This will help them adapt their car to be faster and think about how they will market their car. Ask students to consider:
    - What changes will you make in preparation for the next race in order for the vehicle to perform better?

VIRTUAL TIP

If you are facilitating this lesson virtually, ask students to gather the materials at home and each build their own *prototype*. Give design teams time to collaborate online to complete the steps of the **"From Idea to Production - Student Packet.**"

DURING VISIT ACTIVITY

DAY 5| *Detroit Style: Car Design in the Motor City, 1950–2020*

Instruct students to explore the "***Detroit Style* Presentation**" and at least one of the short videos produced for this exhibition, found at dia.org/detroitstyle. Students should choose one era of car design as a focus. This era will help influence changes to their *prototypes* in the next phase of this project. Have students complete **Step 5: Connect, Extend, Challenge** graphic organizer and provide ample time for students to make connections and discuss them with their design team.

POST-VISIT ACTIVITIES

DAY 6

Facilitate a quick-write reflection **(Step 6: Define the New Problem, Ideate and Adapt)** that asks students to use their previous research and their thinking during their visit to determine how they will change their vehicle to make it more functional AND more marketable. Ask students to consider:

- Will you choose a type of material for the surface of the car?
- Is it decorative and/or does it serve a practical purpose?
- Does the surface material slow the *aerodynamics*?

DAYS 6 AND 7

Allow time for students to make the necessary changes to their prototype. After students adapt their vehicle, explain that they will use **Step 7: Adaptable Data** to race their car again. A second race will expose whose prototype modifications helped to improve speed.

DAY 8

Next, explain to students that they will use Canva.com to create a poster **(Step 8: Market Your Vehicle)** to "market" their vehicle. Ask students to consider:

- Who is your *target audience*?
- Now that you have thought through the materials for the outside design, how does the color choice follow latest trends?
- How can you use the color and other latest trends to promote your prototype to your *target audience*?

DAYS 9 AND 10

1. To wrap up the lesson, first ask students to fill out the **Reflection** in **Step 9**. Before the evaluation takes place, assemble a team of school judges to use the **Step 10: Grading Rubric.**
2. Since this is a STEAM project, consider your Construction Trades Teacher, CAD Teacher, or Automotive Repair Teacher to give a quality judgement from their level of expertise. Use **Step 10: Grading Rubric.** This is a great opportunity for cross-curriculum learning.

This educational resource was developed by graphic design teacher Noelle Scharer in collaboration with the Education Programs at the Detroit Institute of Arts.

ADDITIONAL TEACHER RESOURCES

Career Pathway Information

"Occupational Outlook Handbook, Industrial Designers." Bureau of Labor Statistics, U.S. Department of Labor. Last modified on September 1, 2020. https://www.bls.gov/ooh/arts-and-design/industrial-designers.htm.

"This is how Elon Musk hires..." The not so boring Man. April 21, 2019. Video, 2:30. https://www.youtube.com/watch?v=LLSb8phQ1t8.

The Design Process

"Designing a Car – from Sketch to Presentation." Form Trends. June 14, 2019. Video, 11:25. https://www.youtube.com/watch?v=ar31DrNV_pM.

Van den Acker, Laurens. "Automotive Design: The Life Cycle for Inspiration." TEDx Talks. January 18, 2018. Video, 17:26. https://www.youtube.com/watch?v=MgvledYpkO0.

Historical Background Knowledge for Teachers and Students

"Who built the first automobile?" History.com. July 29, 2019. Video, 3:35. https://www.history.com/news/who-built-the-first-automobile.