*TEACHER:* Mike Lepkyj, Technology Teacher, Medina Teachers Association

*LESSON TITLE: Puff Car: The Design Process*

*SUBJECT:* Technology

*GRADE(S)*: 6-8

*TIME FRAME:* 45 Minutes

*PLANNING AND PREPARATION:*
- Have a sample Puff Car made before the lesson.
- Have all the materials for the puff cars kits ready and prepared for student use.

*MATERIALS/EQUIPMENT NEEDED:*
- Scissors: 1 Pair per team
- Masking tape: 2 feet per team
- Puff Kits (3 straws, 1 piece of cardstock, 4 lifesavers, 2 paperclips)
- Dry Erase marker
- Track for testing
- Example of Puff Car

*LEARNNG STANDARDS:*
- **Content Standard(s): MST Standard 5**: Generate ideas for possible solutions, individually and through group activity; apply age-appropriate mathematics and science skills; evaluate the ideas and determine the best solution; and explain reasons for the choices.

- **Common Core Learning Standard(s):** ELA Reading Standards for Literacy in Science and Technical Subjects 6–12: 3. Follow precisely a multistep procedure when carrying out experiments, taking measurements, or performing technical tasks.

*CONTENT OBJECTIVE:*
- List in order the seven steps involved in the design process with 90% accuracy
- Explain each of the seven steps in the design process
- Improve hand on experience and teamwork skills
- Appreciate the importance of planning and brainstorming when designing
- Recognize the role of troubleshooting, research and development, invention and innovation, and experimentation in problem solving
- Apply the design process to a given project

*ACADEMIC VOCABULARY:*
- Thumbnail Sketches
- Pros and Cons
- Refinement
- Implementation

*DIFFERENTIATED INSTRUCTION:*
- Extended Time
- Allow students to work in larger groups
- One on one instruction

*SEQUENCE OF LESSON ACTIVITIES:*
- Grasp student's prior knowledge and experiences with the design process by asking: Have you ever designed and built something? What steps did you go through before you had a final product?
- GRAB ATTENTION: Show students a puff car and pose the question: What went into making this? (Prompt the students to think of more than just constructing the car.) Entertain students' responses and then lead into how we will do it in this lab. Explain today's lesson objectives.
- Briefly explain the major steps in the design process. As students try to come up with examples of each step, review terminology needed to complete upcoming handout.
- Vocabulary: thumbnail sketches, pros and cons, refinement, implementation.
- Explain the rules, requirements, and behavior expected during the lesson and activity.
- Pass around The Design Process Handout to each student. Allow time to complete.
- Have students talk about which design they choose, and then ask why they chose it.
- Test the puff cars, allow for revisions.
- CONCLUSION: Summarize the key steps in the design process by choosing different students to list the steps in order. Have different students come up to the smart board to write in order the steps.
    1. Problem identification
    2. Research
    3. Brainstorm
    4. Analysis
    5. Build
    6. Test
    7. Redesign

*ASSESSMENT:*
- Students will be tested on their achievement of these objectives on a unit examination and through lab performance, cooperation, and participation.

*Sample test questions:*

*1. Of the design process steps listed below, which one should be done first?*
> *A.      Analysis*
> *B.      Problem Identification*
> *C.      Brainstorm*
> *Answer: B*

*2. What is the name of a quick, small preliminary drawing before a design is started?*
> *Answer: Thumbnail Sketches*

*3. Explain why it is a good idea to brainstorm and explore BEFORE actually constructing a design?*
> *Answer: 1) Your final idea is more refined 2) If your initial idea doesn't work, you have other ideas to fall back on.*

**Process:**

- *What I was thinking about during the lesson writing – the students and implementing the shifts?*
  I was thinking of keeping the lesson as structured as possible to allow students to get used to using the design process.

- *Why I chose the lesson:*

  It is a great way to start the course with 8th graders so that they can learn and implement the design process to help them with problem solving techniques.

**Implementation:**

- *What was the effectiveness of the instructional design?*

  Fairly effective; the students enjoyed the project.

*What concerns or issues do/did I have?*

- There were lack of complete sentences and some issues with students not being aware of restrictions in the project.

*How will/did I revise the lesson?*

- Put more emphasis on using complete sentences when filling out the handout and repeating the restrictions while the students are designing and building their puff cars.

# Puff Car Lesson (Handout)
# Technology Education Challenge

## Challenge:

- Design and build a device that can go the furthest distance with only one puff of air.

## Restrictions:

- You may not push or throw your device. Only one puff of air can propel your device down the track.
- You may only use the materials and tools provided.
- You must use all of the materials
- You will have three trials for the final testing.
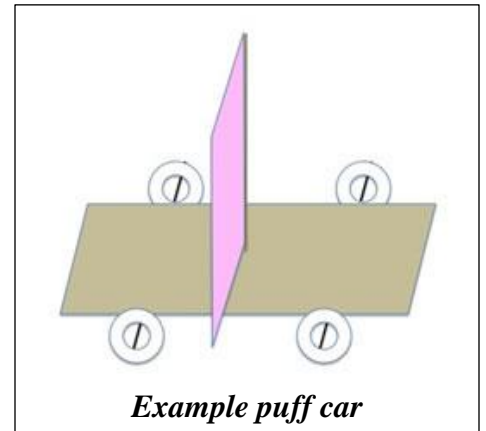
## Part I: Brainstorm Ideas

*Example puff car*

A. Using a pencil, draw thumbnail sketches that communicate your ideas in the space below.

| IDEA 1 | IDEA 2 | IDEA 3 |
|--------|--------|--------|
|        |        |        |

## Part II:  Design

a. Pick your favorite design from the sketches above, and draw what your device will look like from the front, top and side view.  Label all materials and dimensions (length, width, and height)

**Label all materials and show dimensions!**

| TOP VIEW |
| --- |

| SIDE VIEW | FRONT VIEW |
| --- | --- |

## Part III:  Testing Trials

a. Using complete sentences, explain the results of your design.   How far did your puff car travel?

## Part IV:  Conclusions

a. Did your puff car work like you planned?  Explain using complete sentences.

b. Using complete sentences, explain how you would change your device to make it better.