

Travis Olson

Major Project: Engineering Design Challenge

Phase I - Research and Planning - Due Date: Midterm

1. Identify the “Big” concept to be covered by the engineering design challenge.

- I found a great design challenge from the website [www.curiositymachine.org](http://www.curiositymachine.org)
  - The idea of the challenge is to build a robotic arm to pick up objects from the table and place objects in a cup.

2. Research appropriate learning standards associated with the topic.

- ITEEA Chapter 5: Students will develop and understanding of design.
  - Standard 9: Students will develop an understanding of engineering design
  - Standard 10: Students will develop an understanding of the role of troubleshooting, research and development, invention and innovation, and experimentation in problem-solving. (ITEEA, 2007)
- Science; NGSS Standards: MS. Engineering Design
  - MS-ETS1-1: Define the criteria and constraints of a design problem with sufficient precision to ensure a successful solution, taking into account relevant scientific principles and potential impacts on people and the natural environment that may limit possible solutions.
  - MS-ETS1-2: Evaluate competing design solutions using a systematic process to determine how well they meet the criteria and constraints of the problem.
  - MS-ETS1-3: Analyze data from tests to determine similarities and differences among several design solutions to identify the best characteristics of each that can be combined into a new solution to better meet the criteria for success.
  - MS-ETS1-4: Develop a model to generate data for iterative testing and modification of a proposed object, tool, or process such that an optimal design can be achieved. (NGSS, 2018)

3. Identify and discuss the different types of problem solving and declarative/procedure knowledge needed.

- Students will need to understand how simple machines work and how they can be applied to the “real world”.
- Students will need to understand how to sketch

4. Explore objectives and ancillary concepts/content covered by the project.

- Objectives
  - Students will learn about the Engineering design process
    - Identify the problem
    - Brainstorming

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- Design
- Build
- Test and Evaluate
- Redesign
- Share the solution

- Using these Materials, what can you build to grab objects that are two feet away from you?
- How will your grabbing device open and close so it can grip an object and let it go?
- How will you attach your grabber to the end of the stick?
- How will you control your grabber when it's at the end of the stick?

- Ancillary concepts/content Covered by project
  - Simple machines
  - Hydraulic/air pressure and how it can be used
  - How tension, torsion, and compression effect the use of different materials

5. Identify possible activities.

- Use recycle material to build a robotic arm.
- Have students identify materials and processes that can be used to build robotic arm
- Direct students in groups use different materials, specific to the group, to build robotic arm
- Use hydraulic pressure to actuate the grabber

6. Select the best activity for your classroom.

- Have students identify materials and processes that can be used to build a robotic arm.
  - Use hydraulic pressure or air pressure to actuate the arm.