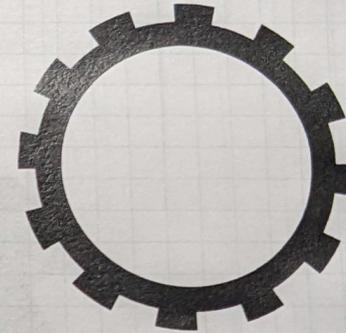


Engineering Design Process



Major Project

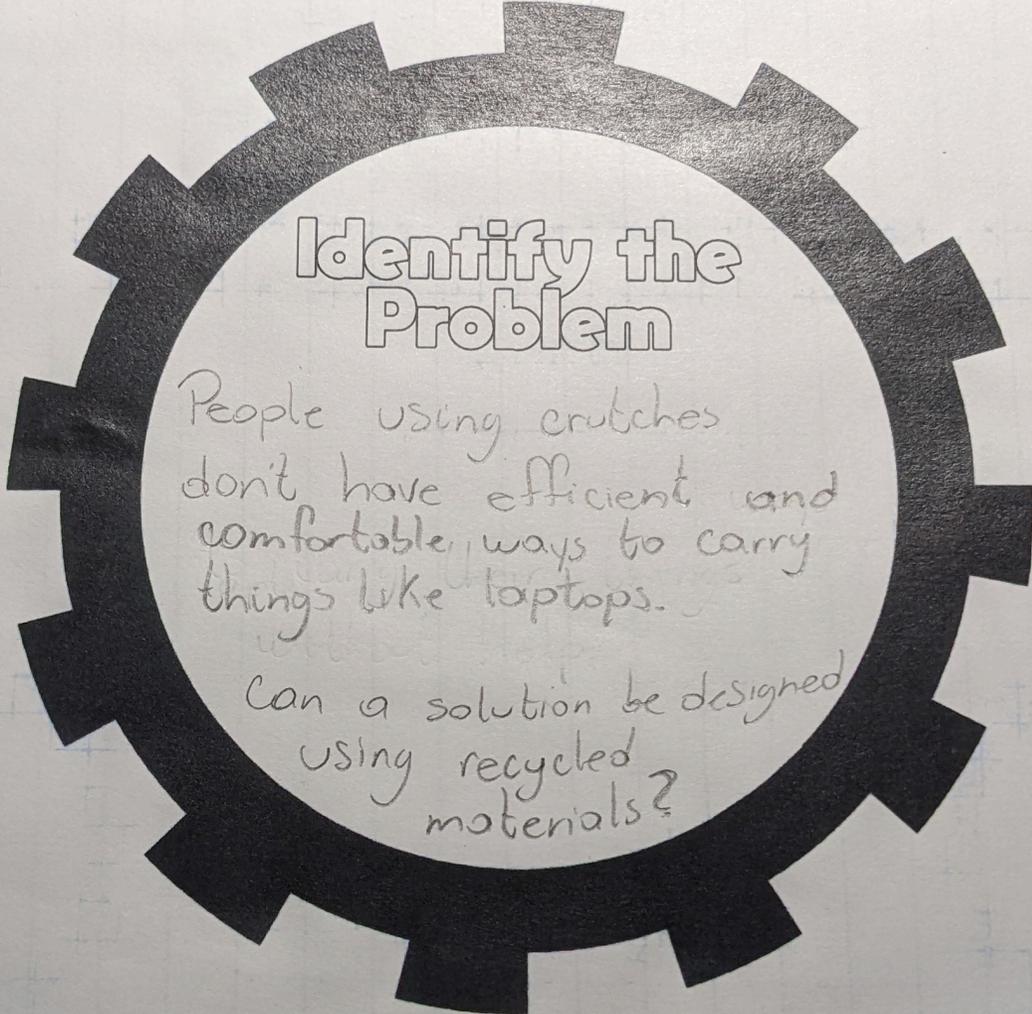
BY: FERNANDO AZCONA

COURSE:

**THE E IN STEM: MEANINGFUL CONTENT FOR ENGINEERING
ENDEAVOR STEM LEADERSHIP CERTIFICATION**

PROFESSOR: DR. JOSH BROWN

SEMESTER: SPRING 2022



Identify the Problem

People using crutches don't have efficient and comfortable ways to carry things like laptops.

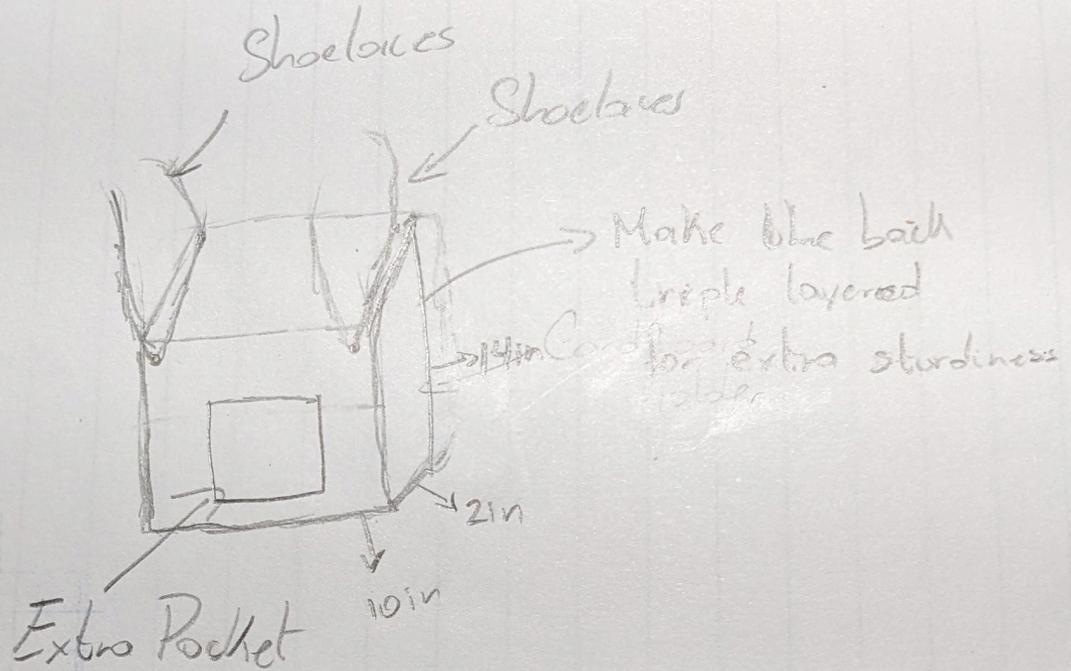
Can a solution be designed using recycled materials?

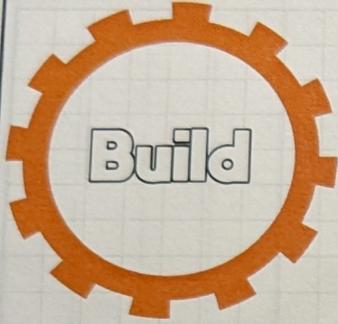


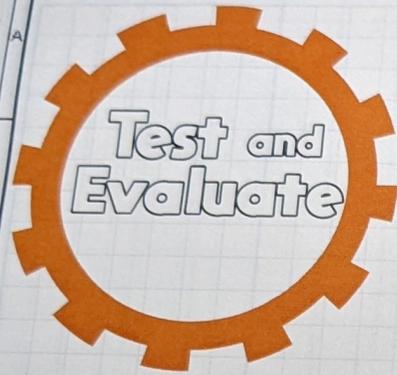
- Use recycled cardboard boxes as the base material
- Find an adjustable material to tie the "holder" to the crutch.
- Make the holder big enough to carry a laptop.

This project will use recycled materials

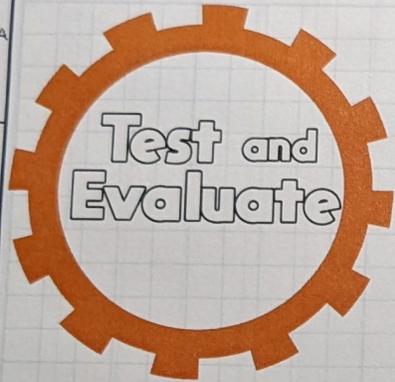
- Cardboxes
- Shoelaces
- Bluegun
- Time available:
150 min.







- The laptop bounces inside the box and need a cushion at the bottom
- The box might need longer laces and a way to also tie it from the handle
- One notebook might be able to fit in the box a well.
- The box seemed to adjust well to different surfaces
- It holds itself well against other surfaces.



Testing video

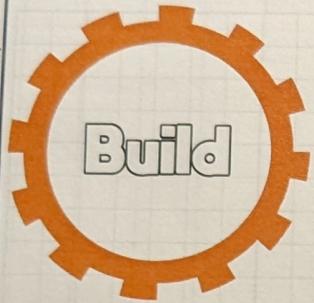


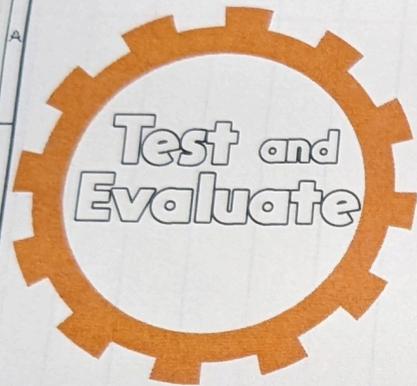
Shoelaces

Longer laces do tie on the arm pit pad. Use other material

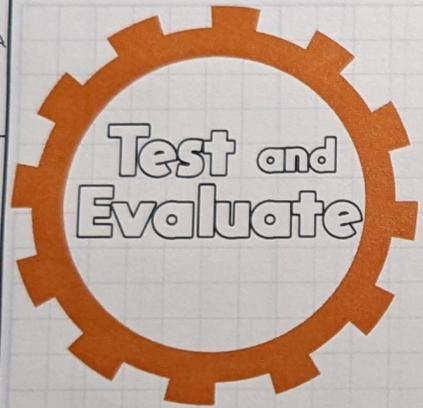
laces to tie from the handle

Styrofoam cushions

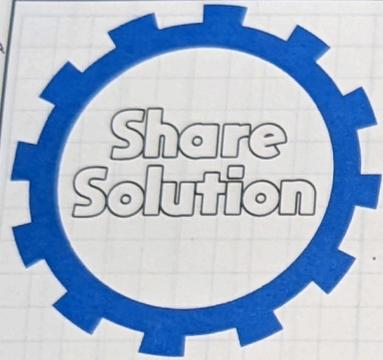




- The new design was provided more stability and sturdiness.
- It was able to work on the same surfaces as the previous design.
- The cushion seemed to help the computer from bouncing.



Testing video



The goal for this design was to provide a way to carry a laptop safely while using crutches, and made from recycled materials.

The best feature of the design are the laces. They are adjustable and provide sturdiness. They also allow the box to remain tied to the crutch without needing to constantly readjust it.

The step that helped the most was designing and redesigning, because it allowed me to visualize the idea making building easier.

If I had more time and resources, I would try 3-D printing the box.



a. What went well with the engineering design challenge?

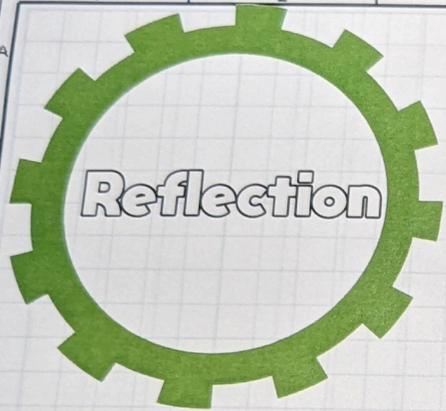
I think what went well during this challenge was the implementation of the EDP model by PBS. I liked how the building, testing, and redesigning "wheel" allows the process to flow more naturally without having to report the final results until the prototype feels completed and functional.

b. What did not go well with the engineering design challenge?

Using glue guns wasn't the best part of this process. A lot of glue had to be used to put some parts together. The crutches I had available were not adequate for my height, so testing was challenging.

c. What concepts were covered (list standards and topics where appropriate).

The concepts covered were the implementation of the EDP to provide a solution for real life problem. The concept of empathy and service were also covered in this lesson. Students were able to understand the difficulty of using crutches and carrying materials needed to be successful in school.



c. What concepts were covered (list standards and topics where appropriate)

Standards

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-ETS1-3. 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.



d. How did the ED process help teach the science and mathematics concepts?

There was not a specific science concept taught through the implementation of the EDP in this particular case. Using recycled materials and being environmentally conscious with designs was something intended with this project. Measurement had to be used but no specific mathematical concept had to be implemented.

e. Did I choose an appropriate engineering design process?

I think the PBS Engineering process was ideal. It was my first time testing it and I enjoyed using it.

Should I simplify or make more complex?

I think this project is an excellent challenge to introduce the EDP to seventh grade students. I don't think it needs to be more complex.

f. How can I improve this activity to use with future students?

In the future I could implement 3D printing for some of the components of the design but that would mean teaching students the software, therefore needing more time. I could implement the use of budgets and business skills by having students create a campaign to promote their product.