PLTW Launch

Problem 2.5 Food Pantry Design Problem

Introduction

As you read, Angelina, Suzi, and Mylo want to find a way to quickly move boxes of donated food from a truck into a building. Just like the students in the story, you have been learning about energy conversion and how engineers can use energy to meet a human need or want.

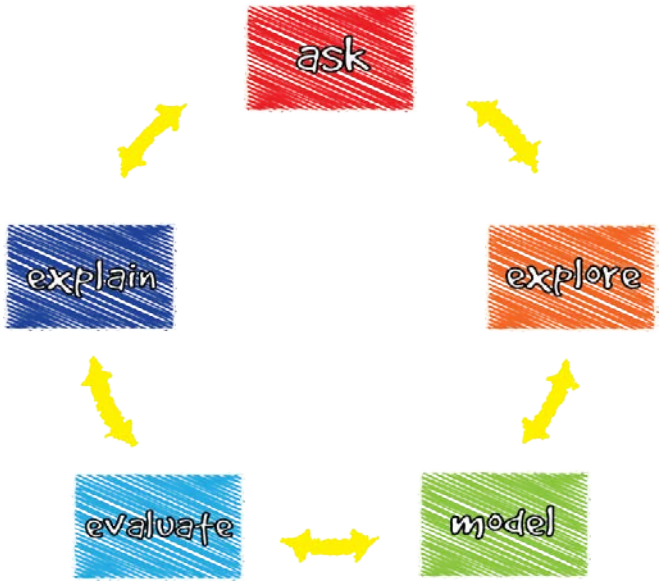
In this problem you will design and model a system to unload boxes of food at a community food pantry.

Equipment

- VEX IQ® Construction Kit
- Launch Log
- Other materials as available

Procedure

1. As part of a team, you will design, sketch, and build a model of a solution to the design problem presented in the story.
2. You will use an engineering design process as you work to develop a solution to the vehicle restraint problem.
    - The **design process** is a step by step way to solve problems.
    - An **engineer** is a person who is trained to use technology, mathematics, and science to solve problems.
    - Engineers use the design process to develop many possible solutions to a problem.



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3. 

   a. The first step is **Ask**
   b. Respond to the following questions in your Launch Log:
      - What is the need or want that we are trying to fulfill?
      - What will make the design solution successful?
   c. Review the criteria and constraints for the design problem below and add this information to the Ask section of the Launch Log.

Criteria Criteria are guidelines or rules for your design.	**Constraints** Constraints are the limitations or restrictions on your design.
• The group will design, build, and test a system to unload boxes of food at a community food pantry. • The system must move boxes of food a minimum of 12 feet. • The model may be scaled down to a scale of 1 inch = 1 foot. If you choose to use this scale, the model must be able to move boxes of food a minimum distance of 12 inches. • The system must convert energy from one form to another to solve the problem.	• Your teacher will determine the amount of time you have to design, sketch, and build your model. • You are limited to the following materials: o VEX IQ® equipment o String o Other materials as determined by your teacher

   d. Follow your teacher's directions to complete the self-assessment at the end of the Ask section.

4. 

   a. The second step is **Explore**
   b. Write or sketch in the Explore section of your Launch Log how others have tried to solve the same problem.

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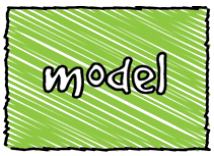
c. You may use the skills and knowledge your team gained from the activities and project in this module as well as any outside information you have to help your group design the best solution.

d. Brainstorm several ideas that may solve the problem and write or sketch them in the Explore section.

e. Talk to your team and share ideas. Add any additional ideas by writing or sketching in your Launch Log.

f. Follow your teacher's directions to complete the self-assessment at the end of the Explore section.

5. 

a. The third step is **Model**

b. In this step you will compare the solutions that your team generated during the Explore step.

c. Use a decision matrix to choose one design or develop a new design that combines the best features of all designs.

d. Detailed instructions on how to use the decision matrix are below:

- The first step in using the decision matrix and analyzing a design is for each team member to present their design and explain how it is supposed to work as well as any special features it may include.
- After each presentation team members will ask questions in order to fully understand your design concepts. They will also make suggestions that might improve your design.
- The second step of this activity is to use the decision matrix to guide the team's selection of the best solution to the design process.
    - In the left-hand column, list each of the designs that are being rated. Example: Mylo's design #1, Mylo's design #2, Suzi's design #1…
    - Rate each design against each criterion using the scale found below the matrix. This can be completed together by the group, or each group member can rate the criteria separately and the total score can be entered. Example: Mylo thinks the criteria for moving the boxes for the first design rates at 3, while Suzi and Angelina only rate them at 2 – the total of 7 should be entered under the first column.
    - Tally the scores to determine the best designs. Add the scores located in the row to the right for each design. The design with the highest score in the total column will indicate the best design.

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- Remember, it is okay to go back in the design process to see if there are any other improvements that could be made to your team's best design. Go back to the decision matrix and see if any of the components could be improved, and then brainstorm to try to find solutions. It is okay to combine ideas and add features from other designs on your team. Once your team has tweaked the final design to include ideas that provided the best score, you should be sure you identify the best design in your Launch Log.

e. Follow your teacher's directions to build a model of your design.

f. Document your design by sketching the final model or taking photographs of the completed model.

g. Follow your teacher's directions to complete the self-assessment at the end of the Model section.

6. 

   a. The fourth step is **Evaluate**

   b. Follow your teacher's directions to test your food box unloading system.

   c. Record the results of your test in your Launch Log.

   d. Follow your teacher's directions to complete the self-assessment at the end of the Evaluate section.

7. 

   a. The fifth step is **Explain**

   b. In this step you will present your design, evaluation, and suggestions for improvement for your prototype of the food box unloading system.

   c. Complete the Explain section of your Launch Log.

   d. Follow your teacher's directions to complete the self-assessment at the end of the Explain section.

8. Follow your teacher's directions to share your design with your classmates and others.

9. It is important to note that although the design process was presented in a specific order in this problem, you may find that you moved back and forth between different steps as you brainstormed new ideas and identified problems while designing and building your system to unload boxes of food.

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Conclusion Questions

1. How did the system you designed convert energy? How do you know?

2. How could you use what you have learned from designing this model to help you solve a problem in your life?

3. What changes would you make to improve the design?

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