

Name _____

Aeroponic Garden Design Challenge

Objective: You will design and construct an aeroponic vertical garden and grow a food crop.

Assignment Description: You are an agricultural engineer who has been hired to develop a small-scale vertical garden for families living in urban areas. Your team has been tasked with designing an inexpensive, self-contained vertical garden unit that can produce food for a family. Use the *Engineering Design Process* to complete this challenge.

You will be provided a 5-gallon bucket, a pump, 1 or more sprinkler heads, and plastic pipe. You will need to design the vertical garden so that the roots of all the plants in the system can be evenly sprinkled with nutrient-rich water every 30 minutes. Your goal is to maximize both the number of plants that can be grown, and the rate of growth of the plants (determined by averaging the height of all the plants at the end of a predetermined period of time). The plants will be provided.

Step
1

Ask: Identify the Problem and Constraints

A technological problem is a problem that may be solved through the development or improvement of technology.

1. What is the problem?

2. What will solving this problem accomplish?

Criteria

Criteria = a set of standards that determines whether a solution is successful or not.

- Your solution must be contained within a 5-gallon bucket.
- You may only use the supplies listed.
- Your solution must be able to grow at least 5 plants.
- Plants must be an edible food crop.

Constraints

Constraint = limitations on the solution

- You will be provided with:
 - 5-gallon bucket, with lid
 - 1 water pump
 - 1 sprinkler head and fittings
 - Plants
 - Timer or Arduino board with necessary accessories (including a solid-state relay)
 - Hydroponic nutrient solution
 - Tools as needed
- You may also ask for:
 - More plastic pipe or pipe fittings, up to 2 additional sprinkler heads, or a different style of sprinkler head, or other supplies as approved by your teacher.

Step
2

Research

Talk to experts and discover what has already been tried. Be sure to research ideal plants varieties that could produce an edible harvest. Keep notes below.

Step
3

Imagine: Develop Possible Solutions

List and describe 5 or more possible solutions. More ideas increase your chances of success!

Step
4

Plan: Select the Best Solution

Evaluate the positive and negative points of each idea from your brainstorm list, consider the criteria and constraints, and choose what you think is the best solution. Describe it in detail below and sketch the design on the next page.



Step
5

Create: Build a Prototype

Get to work! Put your plan into action. Check this step off once your bucket is built, water is flowing, plants are in place, and beginning measurements are taken.

1. Measure and record the starting height of each of your plants. Create a table below. Take a picture to use for comparison at the end of the testing phase.

Step
6

Test and Evaluate

Over the next few weeks you will be testing your aeroponic system to determine if it works.

1. Did your plants stay alive? Why or why not?
2. How much did they grow?
3. Describe the overall health of the plants. Do they appear to have any nutrient deficiencies?

Step
7

Improve: Redesign as Needed

After the testing period is complete, evaluate the overall success and/or failure of the project.

1. What did NOT work?
2. If you were to redesign your system, what would you change?