Robogals Science Challenge

Minor Challenge Set #2
STEM Field: Environmental Science
Level: Intermediate / Senior
Challenge Name: My Sustainable Home
Project Cost: 0-20 USD
Materials Required:

- Planning
    - Paper and sticky notes
    - Pens and markers
    - Ruler
- Building
    - Various pieces of cardboard
    - Masking tape
    - Scissors or craft knife

Safety:

- Be careful when handling sharp objects; ask adults for assistance if needed

Duration:

- The challenge takes approximately 1-2 hours to finish, however, the time guideline is an estimation only, and students and mentors can complete the tasks around their schedules.

Introduction:

Sustainability can refer to a group of systems aimed at reducing our impact on the environment, while promoting innovation to further improve our way of life.

We can think about sustainability in terms of **inputs** and **outputs**. What are the inputs required to begin a certain process, and how can we ensure that these are plentiful and renewable? What are the outputs at the end of a process, and how can these be safely dealt with? Are there any ways to turn these outputs into inputs for other processes?

A greater focus is being placed on building houses with a sustainability focus in mind. In this experiment, we will research, plan and then build a model to showcase our idea of a sustainable home.

Instructions:

1) Draw on paper a basic floor-plan for a home, and label the rooms accordingly. Include a separate area for a front yard, back yard, roof and basement.

2) Using sticky notes, annotate each room/area on your plan with its expected inputs and outputs. These can include:
   a) raw or processed materials
   b) amounts of water
   c) energy (e.g. electrical or heat)

3) Research and consider:
   a) Will the direction of where the sun rises and sets impact your planning? If so, where?

   b) What kinds of plants do you want to have indoors/outdoors, and what features will they have?

   c) Which room/area will consume the most amount of energy? How can this be minimised?

d) Which room/area will consume the most amount of water? How can this be minimised?

e) Where can renewable inputs be used? Where can outputs be recycled, reused, or transformed into other inputs?

Extension - Build a model of your plan

Using your plan, build a model with cardboard and craft material to illustrate your sustainable home in 3D. Be sure to annotate your model with notecards/labels, or provide an accompanying paragraph, to highlight the thought process behind each feature.

Reflection Questions:

- Are there any improvements you would make to this challenge?
- What real world application/s can you apply this challenge to?
- What are the key science and engineering concepts that relate to this challenge?

- Given your sustainable home, what might be some of the cost estimates for some of the features you have installed? How do you predict this will impact other people using this feature in their own homes?
- How might the climate affect your sustainable home? Is your sustainable home more suited to a wet/dry or cold/hot environment, and why?
- You may have included animals as part of your planning. How might animals help contribute to a sustainable household?

Submission Guidelines:

- Submit a photo of the experiment setup. Include a short summary that addresses the reflection questions.

> Note: Remember, if you want to upload pictures of your Minor Challenge that also include you, please check if it is OK with your parent or guardian first.

- The submission form is on the Minor Challenges page: https://sciencechallenge.org.au/index.php/minor-challenges/ Fill out the details and make sure you upload your submission.

Learn More! Resources:

- Wellington City Council - Make your home more sustainable https://wellington.govt.nz/services/environment-and-waste/sustainability/homes/make-your-home-more-sustainable

- Queensland Government - Smart and sustainable homes http://www.hpw.qld.gov.au/construction/Sustainability/SmartSustainableHomes/Pages/Default.aspx

Bibliography:

- Mason, M. (no date) *What Is Sustainability and Why Is It Important?*, *EnvironmentalScience.org*. Available at: https://www.environmentalscience.org/sustainability (Accessed: April 9, 2023).