ACTIVITY
SUSTAINABLE HOMES

Time: 180 minutes

Days of Implementation: 3 days

Grade Level: Upper Secondary

Designed by: Lizzie Muringi

Alignment with STEAM subjects

Science: Understanding features of a sustainable home (i.e., solar panels on the roof that generate electricity, rainwater harvesting systems to collect water).
Technology: Exploring Tinkercad as an app to design architectural spaces.
Engineering: Designing and constructing working models.
Arts: Creating sketches, content, and presentation materials.
Mathematics: Using mathematical tools to measure energy output and calculate energy metrics that can impact a home.

Related or achieved SDGs

- SDG 9: Industry, Innovation, and Infrastructure: Promotes innovation in designing and building sustainable homes.
- SDG 11: Sustainable cities and communities: Encourages students to consider sustainable living and reduce their environmental impacts.

Materials Needed

- Research tools (tablets, books, printed career sheets)
- Tinkercad APP
- Colored cardboard, tape, glue, colors, and scissors
- 3D printer

Lesson Plan

Introduction

Sustainable homes can be an eco-friendly alternative. These homes consume less energy, generate less waste, and are built from recycled materials. These homes often contain items such as solar panels, rainwater harvesting systems, or insulation to save money on heating and cooling.

1. Inquiry & Exploration

Discussion Questions:

- What is SDG 11 focused on? How can we ensure our communities and neighborhoods are more sustainable?
- What does it mean to have a sustainable home[2] ?

2. Investigation & Research

Students research SDG 11, in particular its relation to sustainable homes. Students dive deeper into the specific ways individuals can make a home more sustainable, and how this affects the environment and community.

- Students consider the impacts that homes or other buildings have on the environment. How does designing sustainable homes help reduce carbon footprints, conserve resources, and create healthy living environments? Some links to explore this include:
  - Green Architecture Saving the World | Visiting Sustainable Buildings from Across the Planet
  - Diébédo Francis Kéré: Architecture is a wake-up call. Louisiana Chanel
  - This Eco Friendly Home Shows The Future Of Sustainable Architecture. World Economic Forum
- Students think of sustainable features that can be included in a house, such as rainwater harvesting systems, solar panels, energy-efficient appliances, natural lighting, and green roofs.How do these features contribute to achieving SDG 11? To explore these resources more, explore these links:
  - The 7 Best Features of an Eco Friendly Home, SBRC
  - Construction and Urban Development, Sustainability for all

[2] This activity can be adapted to have students analyze a school or another community building.

3. Implementation & Design

Building Prototypes:

Design a “House of the Future” in Tinkercad or draw it on paper. If designing the house on the app, here are some steps to follow and some ideas for elements to include inside the house:

- Begin by creating a new design in Tinkercad and choosing a shape for the house’s base, such as a rectangle or square. Use the “Box” tool to create the shape and adjust its size and dimensions.
- Add walls and a roof to the base shape to create the house’s structure. Use the “Box” tool to adjust the height and shape of the walls and roof.
- Next, consider what sustainable features to incorporate into the house. For example, install solar panels on the roof to generate electricity or create a rainwater harvesting system to collect water for use in the house.
- Add elements to make the house more comfortable and convenient for its inhabitants. For example:
    - A smart thermostat to control the temperature;
    - A system for automatically opening and closing windows based on the weather;
    - A garden or green wall to promote sustainability and reduce the carbon footprint of the house;
    - Energy-efficient lighting, such as LED bulbs or adjustable light fixtures that adjust their brightness according to the time of day or the amount of natural light in the room;
    - Proper house insulation to reduce the energy required for heating and cooling, lowering energy consumption and bills.
- Consider adding furniture and decorations to the house as well. This could include chairs, tables, lamps, artwork, and plants to create a more homey feel.
- Once all the elements are included in the design, combine them into a single object using the “Group” tool.
- Use the “Export” function to save the design as an STL file, which can be used for 3D printing.

4. Testing & Reflection

Explain the design process:

- Have students explain their process for designing the sustainable house.
    - Students discuss the sustainable features of the house, such as the use of upcycled materials, energy-efficient lighting, water-saving features, and natural ventilation.

Reflection Questions: (students ask themselves)

- What worked well?
- What challenges did you face?
- How could this prototype be used in real life?

5. Presentation & Action

- Students prepare a presentation on why the world should consider SDG 11 when designing future homes.

Criteria

- Understanding of SDG11
- Research and Explanation
- Creativity and innovation
- Presentation Skills

Reflection

- Did students fully understand?
- What should I improve for next time?
- Was the lesson interesting enough for the students?