Lesson Plan: Design a Sustainable City

Subject: Interdisciplinary (Math, Science, and English)
Grade Level: Middle School or High School (Grades 7–10)
Duration: 5–6 lessons (each 50–60 minutes)
Project Duration: 1–2 weeks (Depending on class time and scope)

Lesson Focus:

This lesson focuses on guiding students through a Project-Based Learning (PBL) experience in which they will design a sustainable city, applying concepts from mathematics, science, and English to real-world problems. The project culminates in a presentation where students pitch their city designs.

Learning Objectives:

By the end of the project, students will be able to:

1. Design a sustainable city with eco-friendly energy systems, waste management, and green spaces.
2. Use mathematical calculations to estimate energy consumption, water usage, and carbon footprints.
3. Write a detailed proposal explaining their city's design and the sustainability features they included.
4. Collaborate in teams to create a final presentation pitching their sustainable city concept.

Materials Needed:

- Graph paper or digital design tools (e.g., Google Drawings, AutoCAD, Tinkercad)
- Calculators and/or computers with spreadsheet software (Excel, Google Sheets)
- Access to online resources for research (energy efficiency, sustainable architecture, etc.)
- Projector or presentation software (PowerPoint, Google Slides)
- Markers, rulers, and other drawing supplies (for physical model-building if required)
- Rubric for assessing the project

Lesson Breakdown:

Lesson 1: Introduction to Sustainable Cities

Objective: Students will understand what makes a city sustainable, including renewable energy sources, water conservation, and waste management.

Activities:

1. **Introduction (15 mins):**

   Begin by discussing what makes a city "sustainable." Use real-world examples like **Copenhagen** or **Portland** to illustrate key features such as renewable energy, efficient public transportation, and green spaces.

   Ask students:

   What makes a city sustainable?

   What are the benefits of living in a sustainable city?

2. **Group Activity (25 mins):**

   Divide students into small groups (3-4 students) and have them brainstorm ideas for their own sustainable city. They should list features they think are essential, such as renewable energy sources, water management, and waste recycling.

   Provide a **graphic organizer** to help students list ideas and categorize them (e.g., "Energy," "Transportation," "Green Spaces").

3. **Class Discussion (10 mins):**

   Have each group share one key feature of their city. Discuss how each feature contributes to sustainability.

4. **Homework Assignment:**

   Research one aspect of sustainable cities (e.g., solar power, water conservation, or waste management) and come prepared to present findings to the class in the next lesson.
