"Sustainable Cityscapes: An Interdisciplinary Approach to Eco-Friendly Urban Design at the TGSB Learning Ecosystem"

This concept in the TGSB Lesson Plan encapsulates the project's focus on combining various fields of study—physics, mathematics, and environmental science—to create sustainable and innovative urban solutions, highlighting the comprehensive and collaborative nature of the learning experience.

At The Green School Bangalore (TGSB), we believe in empowering students to address real-world challenges through innovative and experiential learning. The "Urban Eco-Architects" program is an immersive, hands-on project designed for high school students, focusing on sustainable urban planning and eco-friendly architecture. This program not only teaches students about the principles of sustainable design but also engages them in creating practical solutions for urban environmental issues.

Overview of the Urban Eco-Architects Program

Objective: To provide students with a comprehensive understanding of sustainable urban planning and architecture through experiential learning, while developing practical solutions for real-world environmental challenges in urban settings.

Key Themes:

1. **Sustainable Architecture and Design**
2. **Urban Planning and Green Infrastructure**
3. **Renewable Energy Integration**
4. **Water Management Systems**
5. **Community Engagement and Impact**

Program Phases at TGSB

1. Foundation Workshops and Guest Lectures:

- Workshops: Conduct a series of interactive workshops on topics such as green building materials, passive solar design, urban biodiversity, and renewable energy sources.
- Guest Lectures: Invite architects, urban planners, and environmental scientists to share their expertise and insights, providing students with diverse perspectives and professional knowledge.

2. Field Trips and Case Studies:

- Sustainable Building Visits: Organize visits to eco-friendly buildings and green spaces in Bangalore, such as green-certified offices, eco-parks, and residential areas with sustainable features.
- Case Studies: Analyze successful sustainable urban projects from around the world, discussing their design principles, challenges, and impacts.

3. Collaborative Design and Planning:

- Team Formation: Students form interdisciplinary teams, each taking on different aspects of urban planning and sustainable design.
- Project Brief: Each team is assigned a hypothetical urban area to redesign with sustainability in mind, incorporating elements such as green roofs, rainwater harvesting systems, solar panels, and community gardens.

4. Construction of Scaled Models with the art of design thinking:

- Model Building: Using sustainable and recycled materials, students construct scaled models of their urban designs. This hands-on activity helps them understand the spatial and material aspects of sustainable architecture.
- Functional Prototypes: Include functional elements such as miniature solar panels, water filtration systems, and green roofs to demonstrate how their designs work in practice.

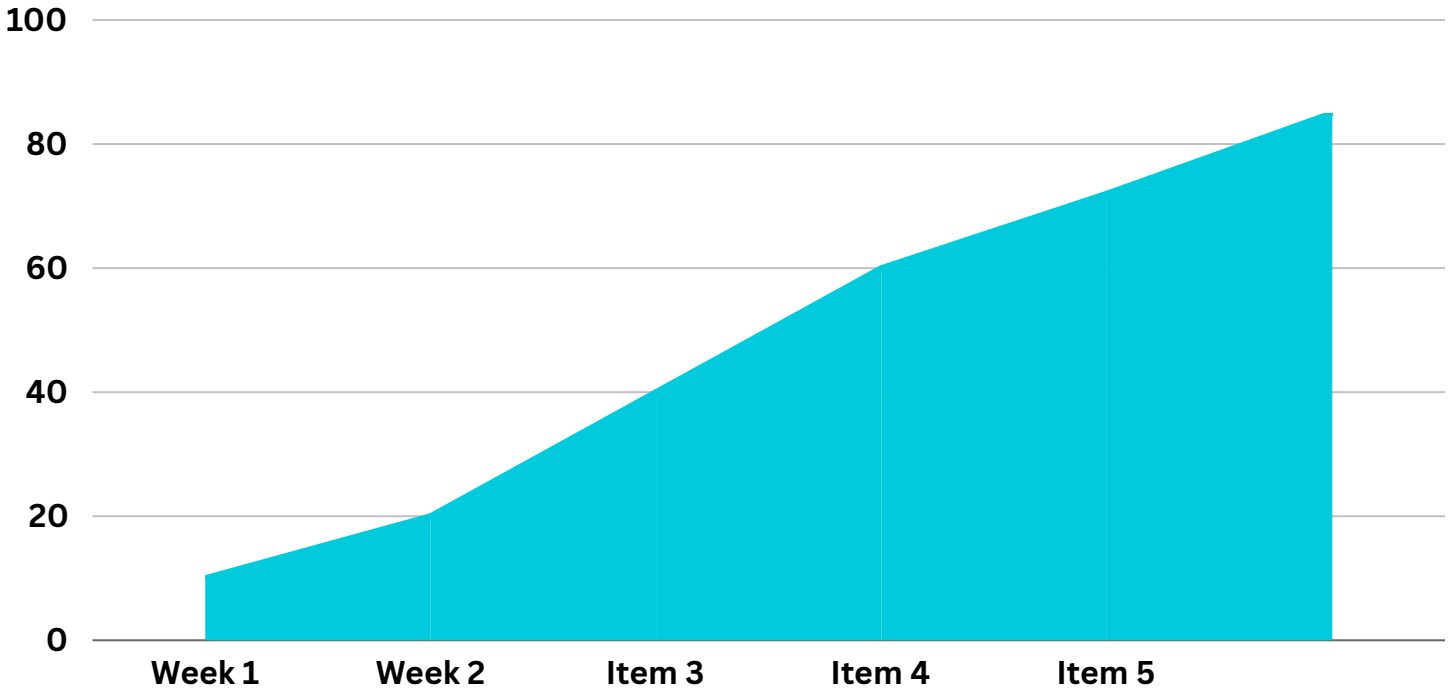
5. Community Engagement and Presentation:

- Public Exhibition: Organize a public exhibition where students present their designs and models to the school community, local residents, and city planners.
- Feedback and Discussion: Facilitate discussions and gather feedback from attendees, encouraging students to consider diverse viewpoints and real-world applicability.

Integrating Physics, Math, and Environmental Science in the "Urban Eco-Architects" Program

Learning curve of the TGSBians across 6 weeks shows the progress in the following components

- *Week 1-Progress in Basic concepts and Vocabulary*
- *Week 2- Growth in doing In-depth research and case studies*
- *Week 3-Growth in handling Design and simulation*
- *Week 4-Growth in learning the ARt of Design Thinking*
- *Week 5-Initiative in Community Engagement and Participation*
- *Week 6-Transforming to a Reflective Strategist in Future Planning*



The "Urban Eco-Architects" program at The Green School Bangalore (TGSB) is designed to be interdisciplinary, drawing on principles from physics, mathematics, and environmental science to provide a holistic educational experience. Here's how each of these subjects is integrated and learned through this project:

Physics

1. **Renewable Energy Systems:**
   - **Solar Panels:** Students learn about photovoltaic cells, the photoelectric effect, and how solar panels convert sunlight into electrical energy. They calculate the efficiency and power output of solar panels based on real-world data.
   - **Wind Turbines:** Explore the physics behind wind energy, including the principles of aerodynamics and the conversion of kinetic energy from wind into mechanical and then electrical energy.
2. **Building Physics:**
   - **Thermal Insulation:** Study the principles of heat transfer (conduction, convection, and radiation) to design buildings that maintain energy efficiency. Calculate the R-values (thermal resistance) of different materials used for insulation.
   - **Structural Integrity:** Learn about the forces and stresses on building structures. Understand concepts such as tension, compression, and shear forces to ensure buildings can withstand environmental loads.
3. **Hydrodynamics:**
   - **Water Management Systems:** Apply principles of fluid dynamics to design efficient rainwater harvesting systems, greywater recycling, and stormwater management solutions.

Mathematics

1. **Geometry and Trigonometry:**

    - **Design and Modeling:** Use geometric principles to create accurate scale models of buildings and urban layouts. Apply trigonometry to calculate angles and dimensions in the construction of roofs, walls, and other structural elements.
2. **Calculus and Algebra:**
    - **Energy Calculations:** Use calculus to model the changing output of renewable energy systems over time and optimize their placement and orientation.
    - **Optimization Problems:** Solve algebraic equations to optimize the use of resources, such as minimizing waste or maximizing energy efficiency.
3. **Statistics and Data Analysis:**
    - **Environmental Impact Assessments:** Collect and analyze data on energy consumption, waste production, and water usage. Use statistical methods to interpret this data and make informed decisions about sustainable practices.

Environmental Science

1. **Ecosystem Services:**
    - **Urban Biodiversity:** Study the role of green spaces and biodiversity in urban environments. Understand how plants and green roofs contribute to air quality, temperature regulation, and stormwater management.
2. **Sustainable Practices:**
    - **Materials Science:** Investigate sustainable building materials, such as recycled plastics, bamboo, and eco-friendly concrete. Learn about the life cycle assessment of materials to determine their environmental impact.
    - **Waste Management:** Develop waste reduction strategies, including recycling and composting, and study their environmental benefits.
3. **Climate Science:**
    - **Impact of Urbanization:** Understand the effects of urbanization on climate change. Learn about the urban heat island effect and strategies to mitigate it through reflective materials and green infrastructure.
    - **Carbon Footprint:** Calculate the carbon footprint of different building designs and urban plans. Explore ways to reduce carbon emissions through energy-efficient designs and renewable energy integration.