CO2 Monitoring Projects for After-School Club

# Summary

This document provides a comprehensive collection of CO2 monitoring projects designed for an after-school club using cheap pre-built 3D sensors that measure CO2, temperature, pressure, and humidity. The projects span various environments and learning objectives, offering engaging hands-on activities for students to understand environmental monitoring and the carbon cycle.

# Project Development Process

1. Brainstorming: We researched and developed 16 diverse project ideas spanning environmental monitoring and experimental approaches
2. Selection: We selected 8 projects based on engagement potential, educational value, and feasibility for after-school implementation
3. Detailed Development: Each selected project was developed with comprehensive procedures, materials lists, and expected outcomes
4. Validation: All projects were validated for relevance, feasibility, and educational value in an after-school setting

# Recommended Projects

Here is a list of **project outlines**:

### 1. ****Living Near a Road****

* Measure and compare CO₂ levels at different distances from a busy road.
* Investigate the relationship between traffic density and CO₂ concentration.
* Assess potential health or environmental impacts on residents.

### 2. ****Urban vs. Rural Living (CO₂)****

* Compare CO₂ levels in urban and rural school locations.
* Analyse how population density and transport patterns affect air quality.
* Discuss implications for sustainable living and urban planning.

### 3. ****Gas Central Heating (CO₂)****

* Measure indoor CO₂ during heating vs. non-heating periods.
* Compare homes with gas heating to those using alternatives (e.g., electric).
* Examine the role of ventilation and insulation in indoor air quality.

### 4. ****Living Near an Industrial Area (CO₂)****

* Monitor CO₂ near industrial zones vs. residential zones.
* Investigate possible spikes during working hours or specific processes.
* Explore links between industrial activity, emissions, and local environment.

### 5. ****Year-on-Year Change (CO₂)****

* Compare CO₂ data from the same period across multiple years.
* Identify trends and possible causes (e.g., policy changes, weather patterns).
* Use historical data to project future scenarios or improvements.

### 6. ****Daily Variation and Photosynthesis****

* Record CO₂ levels over 24-hour cycles in areas with and without vegetation.
* Identify patterns linked to photosynthesis during daylight hours.
* Discuss the importance of green spaces in regulating CO₂.

### 7. ****Student Performance or Behaviour vs. CO₂****

* Track classroom CO₂ levels and correlate with concentration or test results.
* Observe behavioural patterns at high vs. low CO₂ levels.
* Propose ventilation or scheduling strategies to improve learning conditions.

### 8. ****Collaborating with Other Schools****

* Share CO₂ data with schools in different locations or countries.
* Compare environmental impacts of geography, infrastructure, and lifestyle.
* Develop joint reports or campaigns on improving air quality.

### 9. ****Classroom Air Quality Investigation****

* Monitor CO₂ levels in different classrooms to understand ventilation and occupancy effects.
* 2–4 week time-frame with minimal additional resources required.
* Strong connections to environmental science and building health.

### 10. ****CO₂ in Crowded vs. Empty Spaces****

* Investigate how human occupancy affects CO₂ build-up in enclosed spaces.
* Shorter 1–2 week time-frame ideal for maintaining engagement.
* Immediate relevance to student experience with clear, observable results.

### 11. ****Plant Photosynthesis and CO₂ Study****

* Create controlled environments to measure how plants affect CO₂ levels.
* 2–3 week time-frame with moderate resource needs (plants, containers).
* Excellent hands-on learning about photosynthesis and the carbon cycle.

### 12. ****Home vs. School Environmental Comparison****

* Compare CO₂ and environmental factors between homes and school buildings.
* 2–4 week time-frame requiring permission for home sensor use.
* Strong personal relevance increases student engagement.

### 13. ****School Microclimate Mapping****

* Create maps of CO₂, temperature, pressure, and humidity across the school campus.
* 3–5 week time-frame with excellent environmental diversity.
* Develops spatial mapping and data visualization skills.

### 14. ****Composting and Decomposition CO₂ Study****

* Monitor CO₂ production during decomposition of organic materials.
* 3–5 week time-frame with moderate resource needs.
* Strong connections to biology, carbon cycle, and sustainability.

### 15. ****Weather and CO₂ Relationship Study****

* Investigate correlations between weather conditions and CO₂ levels.
* Consider shortening from proposed 4–6 weeks to fit club schedule.
* Excellent connections to meteorology and climate science.

### 16. ****Traffic and Air Quality Correlation****

* Measure how vehicle traffic affects local CO₂ levels at varying distances.
* Requires careful safety protocols for roadside measurements.
* Strong real-world relevance to environmental science and transportation.

# Implementation Recommendations

1. Getting Started: Begin with projects to build student confidence and skills
2. Project Selection: Choose subsequent projects based on student interest and available resources
3. Adaptability: Modify project scope as needed to fit your specific club schedule and equipment
4. Documentation: Encourage students to maintain detailed records of their observations and measurements
5. Extension: Consider culminating with a school environmental fair to showcase student findings.