



LAB IN A CUBE

- A PocketQube for Education -



Website

Objective:

Our project addresses the **huge gap between interest in space and practical educational tools** in schools. Its primary goal is to **provide practical exposure to real satellite systems**, allowing students to understand how electronic components interact and to experiment directly with a “Do it yourself” approach”.

Beneficiaries

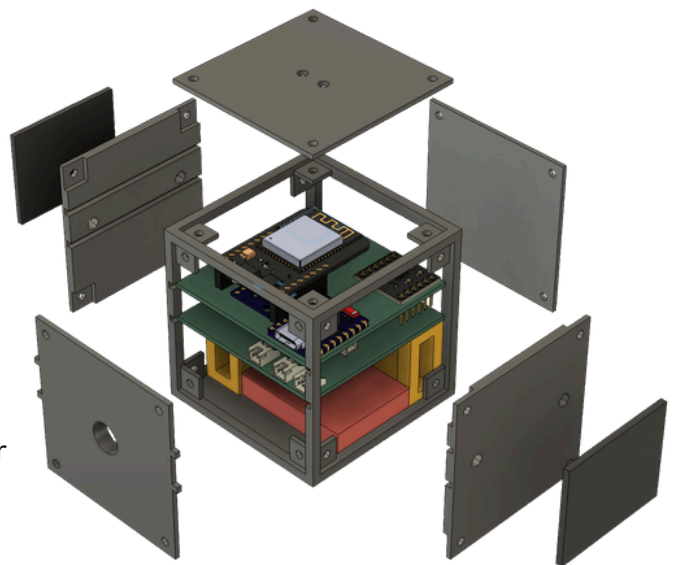
This product was designed for **students by students**. Every student ranging from **children and teenagers in secondary schools to undergraduate and graduate university students** are more than welcome to test our product and therefore have hands-on laboratory activities.

Technological Solution

Lab in a Cube is a "Do it yourself" PocketQube satellite kit designed for lab activities with the purpose of **teaching students how real satellite subsystems work**.

The key technical features include:

- **Microcontrollers:** It utilizes the ESP32-S3 Mini for main processing and the ESP32-CAM to handle image processing without overloading the main system.
- **Modular Architecture:** The design allows for the easy removal and integration of different subsystems.
- **Payload:** An integrated camera captures video, simulating how a real satellite photographs the Earth's surface using scale models.
- **Sensors and ADCS:** It features an IMU (MPU-6050) for acceleration and angular velocity, and a magnetometer (GY-271). For attitude control, it uses a magnetorquer (coils and H-bridges) that reacts to a fixed magnet simulating the Earth's magnetic field to rotate the satellite on its Z-axis.



Cost and Competitive Advantage

The project's main differentiator is its **accessibility**. While commercial **competitor kits can cost between \$9,855 and \$12,350**, the Lab in a Cube is designed to cost **approximately 85€**. It balances high fidelity (replicating core satellite functions) with a minimal cost, **making it beginner-friendly yet challenging**.