

HABPi – A Cross-Discipline Hands-On Adventure

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Objectives

HABPi is both an open source software development project and a project in STEM education. Our goals are to:

- Provide a low cost general purpose hardware and software framework for High Altitude Ballooning [1].
- Introduce students of all ages to STEM activities and allow them to participate in research projects.
- Conduct workshops and create materials to support teachers in HAB related activities.
- Conduct professional high altitude research.

Introduction

One of the main problems facing STEM education in the United States is a lack of meaningful opportunities for STEM exploration [2]. Moreover, the current STEM climate requires a broad base of knowledge which is best obtained through project based learning [3]. HABPi is one such project which combines elements of engineering, science, computer science, mathematics, and data analysis. All of this is wrapped in an unforgettable adventure which takes students to the edge of space!



Figure 1: Students Assemble Electronics



Figure 2: CCS Fifth Grade Payload at an altitude of 27 km - May 13, 2017



Figure 3: Students Launch a Balloon

Materials

A HABPi expedition uses the following elements:

- Payload boxes, constructed of foam and tape. These are designed and built by the students.
- A Raspberry Pi computer
- Sensors and Experiments (Designed, built, and programmed by students.)
- A stratospheric research balloon, rigged and flown by students and HABPi team members.

Project Timeline

- 2016 Construct and fly HABPi prototypes with college students.
- 2017 Pilot flights with grade school students of various age groups.
- 2018 Plan curriculum possibilities and begin developing classroom materials.
- 2019 Finish classroom materials and manuals, conduct flights with more groups of students.
- Summer 2020 Begin workshops to train teachers in the use of HABPi materials in classrooms.

References

- [1] Robert Lowe.
Habpi: An open source extensible framework for high altitude balloons.
AHAC, 2017.
- [2] Nancy DeJarnette.
America's children: Providing early exposure to stem (science, technology, engineering and math) initiatives.
Education, 133(1):77-84, 2012.
- [3] TJ Kennedy and MRL Odell.
Engaging students in stem education.
Science Education International, 25(3):246-258, 2014.

Learning Objectives

- Computer Science** Programming automated experiments and sensors.
- Structural Engineering** Construction of a box which can withstand extreme cold and low pressure environments all while working within strict weight requirements.
- Electrical Engineering** Construction of experiments and sensor arrays.
- Mathematics and Statistics** Collect and analyze real world data.

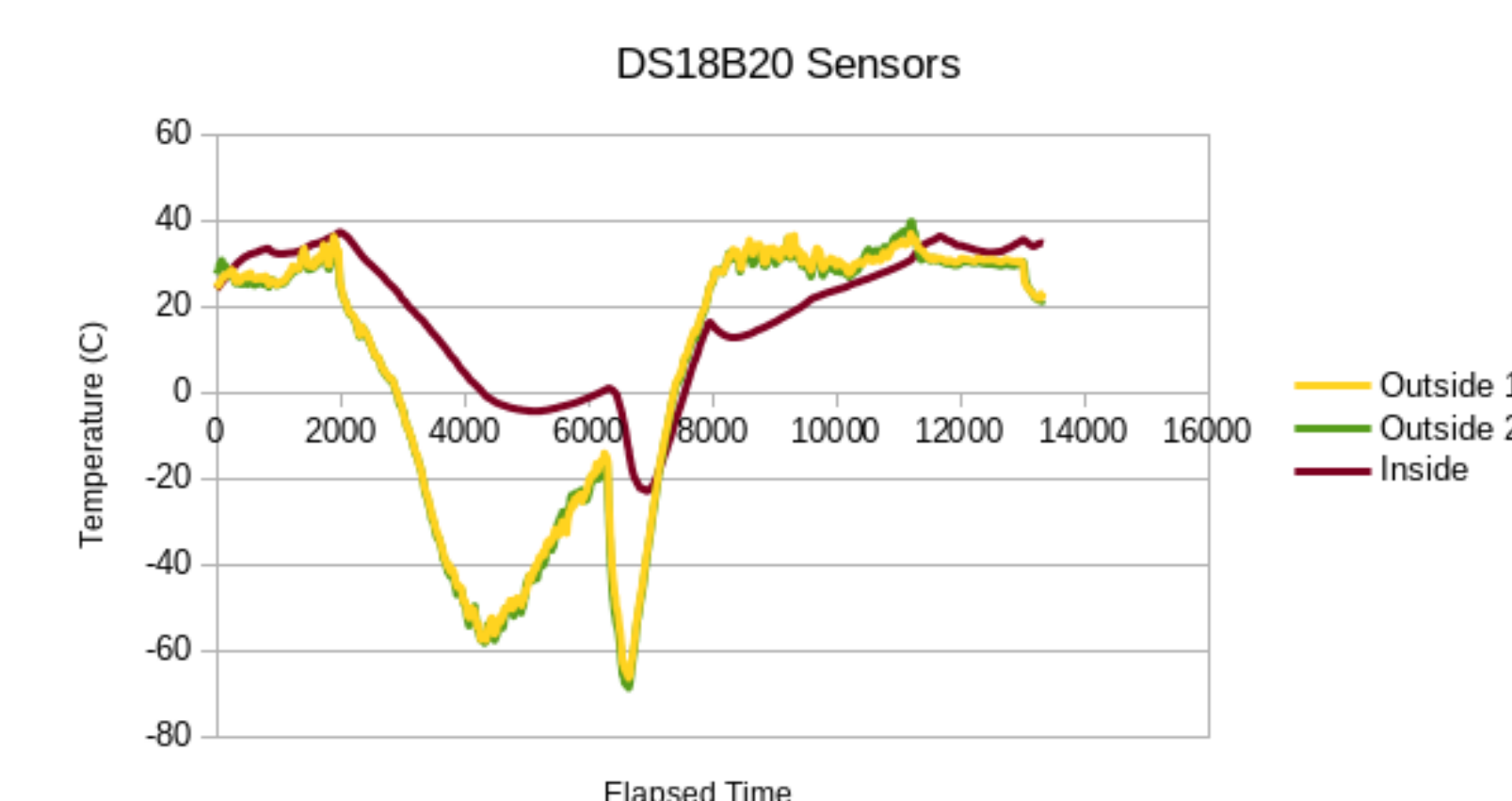


Figure 4: Temperature Data Reveals Atmospheric Layers

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