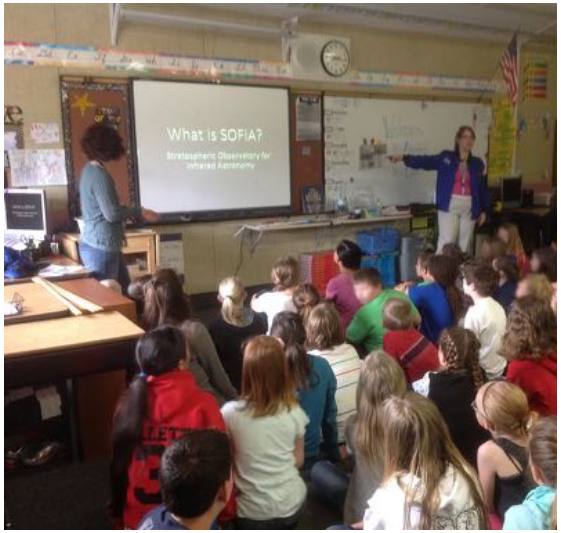
Airborne Astronomy Ambassadors (AAA)

- **Summary:** The AAA project aims to measurably **enhance student STEM engagement and achievement** in selected school districts via **teacher professional development** consisting of:
  - Teacher pre-flight **STEM content learning in astrophysics** and planetary science via webinars & in-person workshops;
  - A week-long **STEM immersion experience** at NASA's science research aircraft facility in Palmdale, California, **including participation in research flights on SOFIA**;
  - Follow-through involving webinars & connections with **NASA subject matter experts (SMEs)**;
  - **Impact on student STEM learning & engagement** within context of national & state science education standards will be **evaluated via a controlled protocol**.

Airborne Astronomy Ambassadors



- **Audiences:**
  - Teacher participants: high school physics & physical science teachers;
  - Students of teacher participants: ~ 2000 students in Cycle 5, 2017-18 school year.

- **Selection criteria for districts & schools**:
  - Opportunity for broad impact on STEM education & engagement;
  - Diversity of students, under-served populations;
  - Geographical scope limited in current research phase to N. & S. California.
  - Seven school district MOUs signed: Santa Clara USD, Vista USD (San Diego County), East Side Union HSD (San Jose), Antelope Valley USD, Campbell UHSD (Santa Clara County), Manteca USD (Central Valley), Hart UHSD (L.A. County), Anaheim UHSD.

AMBASSADOR SELECTION, SOFIA Cycles 5 & 6 (2017 & 2018)

- Candidates must have 3+ years teaching experience.
- Candidates must be assigned to teach at least 2 sections, in any combination, of the following high school courses: Non-AP Physics, Physics of the Universe (integrated science), Astronomy, Earth & Space Sciences.
- Partner districts select eligible applicants with AAA team oversight.
- WestEd evaluators randomly assign selected AAAs to Group A or Group B.
- Group A: Professional development begins January 2017; fly in Fall 2017 (C5).
- Group B to act as “control” in 2017-2018 school year.
- Group B: Professional development begins January 2018; fly in Fall 2018 (C6).

Airborne Astronomy Ambassadors

- **2017 highlights:**
  - Cycles 5 & 6 selections announced (January 2017).
  - Cycle 5 Professional Development started (January 2017).
  - AAA staff produced 2-week EM spectrum / multi-wavelength astronomy curriculum.
  - Curriculum 1st draft pilot-tested in Cycle 4 classrooms (January – May 2017).
  - Workshops guided Cycle 5 through through curriculum (June 2017).
  - Cycle 5 teachers fly on SOFIA (Fall 2017).
  - Cycle 5 teachers implement curriculum (w/ pre- & post-tests) (Fall – Winter 2017).

EVALUATION PLAN

Design points:

- A randomized control trial; delayed "treatment" provided to control group.
- Monitor / prevent within-district "bleeding of treatment."

Measurables:

- *Standards-based* assessment of STEM engagement & achievement by students of teacher participants, measured via instruments & protocols developed with the help of external evaluator.
- Students surveyed before & after "treatment" of their instructors.

Ambassador educator evaluation:

- Interview and observe teacher Ambassadors during flight week.
- Observe, interview, and survey Ambassadors regarding classroom implementation.

DATA AVAILABLE AT THE END OF CY18:

- Student outcome measures for treatment classrooms vs. control classrooms:
  - Assessment of learning in relation to California Science Framework / NGSS
  - Assessment of interests in STEM, STEM learning, STEM majors, STEM careers
- Teacher views of student engagement & learning.
- Documentation of teaching implementation.
- Data to be collected regarding an estimated 1000-2000 students in each group (treatment & control) by the end CY18 (end of current Cooperative Agreement).

Extra

Standards-based Assessment

California Science Framework / NGSS:

- Assessments to address key relevant ideas, practices, and concepts:
  - Disciplinary Core Ideas (DCI): Waves; Electromagnetic Radiation; The Universe and Its Stars
  - Science and Engineering Practices (SEP): Asking questions and defining problems; Constructing explanations and designing solutions; Engaging in arguments from evidence; Analyzing and interpreting data.
  - Crosscutting Concepts (CCC): Patterns; Scale, proportion, & quantity