

SPACE EDUCATION AND OUTREACH SYMPOSIUM (E1)

Lift Off - Secondary Space Education (2)

Author: Dr. Kareen Borders
University of Washington, United States

Dr. Michelle Thaller
National Aeronautics and Space Administration (NASA), Goddard Space Flight Center, United States

Dr. Robert Winglee
University of Washington, United States

Dr. Marge Plecki
University of Washington, United States

Dr. Margery Ginsberg
University of Washington, United States

THIS GENERATION'S SPUTNIK : ELIMINATING THE POVERTY ACHIEVEMENT GAP IN K-12 SCIENCE THROUGH THE USE OF SPACE SCIENCE EDUCATION

Abstract

The origins, evolution, and ultimate fate of our Universe are the perfect venue for STEM education reform—the “Sputnik” of this century to catalyze our youth to become globally competitive and globally cooperative at the same time. A case study of a middle school in Washington State, Key Peninsula Middle School (KPMS), illustrates the dramatic improvement that results from not thinking outside of the box, but rather building a new box that incorporates secondary space education.

The poverty achievement gap in science for 8th graders in Washington State has been consistent over the last five years, ranging from 32.1 percentage points to 27.0 percentage points (low income vs. non low-income student meeting standard on 8th grade state science assessment.) The gap for students at KPMS has also been consistent until the 2010-2011 school year, ranging from 20.0 to 30.8 percentage points prior to 2010.

More importantly, the STEM pipeline from K-12 to college is jeopardized. The science poverty achievement gap in K-12 education can be successfully addressed through the use of space science in preparing students for college and career readiness. Foundational elements include: the expansion of career and technical education (CTE) standards and experiences into science classes, year-long science professional development for teachers, astronomy research experiences for students and teachers, space science mentors, and increased partnerships with families, community members, and STEM organizations.

The case study school involved middle school students in many tiers of space science research. Authentic research experiences for students were supported by the inclusion of a year-long space science course with a focus on student research and opportunities for students to present their research at national symposia. Student-authored research includes microgravity experiments, sounding rocket experiments, galaxy composition analysis, lunar engineering designs, and Mars Lander engineering designs.

Sustained partnerships with aerospace career role models provided real-world connections for middle school students. STEM mentors included representatives from Green River Community College, McChord Air Force Base, Pacific Science Center, the Museum of Flight, local STEM experts, graduate students from the University of Washington, high school STEM mentors, NASA scientists and engineers, astronauts, and more.

In two years, Key Peninsula Middle School narrowed the 8th grade poverty science achievement gap from 29.8 percentage points to 7.3 percentage points. For comparison, Washington State's gap during

these two years changed little, moving from 28.7 percentage points to 27.0 percentage points.
Qualitative data will also be discussed along with additional quantitative data.