

IAF SPACE EDUCATION AND OUTREACH SYMPOSIUM (E1)  
Lift Off - Secondary Space Education (2)

Author: Mrs. Margot Solberg  
Ecuadorian Civilian Space Agency (EXA), Ecuador, msolberg@cotopaxi.k12.ec

CUBES IN SPACE: CAN THE IMPLEMENTATION OF STUDENT-DESIGNED SPACE PAYLOADS  
INCREASE ENGAGEMENT AND CONTINUED MOTIVATION IN SCIENCE, TECHNOLOGY,  
ENGINEERING, ARTS AND MATHEMATICS (STEAM)?**Abstract**

Cubes in Space, an innovative program with idoodledu inc., collaborates with the National Aeronautics Space Administration (NASA) to launch student-designed experiments on sounding rockets at NASA's Wallops Flight Facility, and atmospheric balloons with NASA's Columbia Scientific Balloon Facility. Additional collaboration takes place with NASA's Goddard Space Flight Center and Langley Research Center, the Colorado Space Grant Consortium and, in this action research project, the Ecuadorian Civilian Space Agency (EXA). This international competition is available for students between 11 and 18 years old, is offered at minimal cost, and seeks to encourage long-term interest and skills development in science, technology, engineering, arts and math (STEAM). The Cubes in Space program encourages students to effectively engage in: meaningful scientific research, hands-on engineering, technology integration, project-based problem solving, inquiry, embedded arts objectives, and student-centered and cooperative learning opportunities. After creating an experiment that addresses an Earth and/or space-based need or problem, students submit proposals for experiments that fit within 4x4x4 centimeter cubes. After passing a Preliminary Design Review Panel, approximately 200 experiments are accepted annually and their designers, most in teams, are then eligible to participate in a Rocketfest; which includes student presentations, networking and observing their experiments launch by rocket. Afterwards, students analyze data and share their findings globally. This action research project sought to discover if the implementation of a student-designed space payload program could increase engagement and continued motivation in STEAM. Students in the study participated in an after school space club program, from September 2016 through June 2020, at an international American school, Academia Cotopaxi in Quito, Ecuador; during which 13 experiments were flown into space. Data was collected through both qualitative and quantitative sources, including a control group, and utilized resources such as a Fortus Vedder-Weiss Continuing Motivation for Science Survey, Likert-type attitude surveys, parent questionnaires, photos, videos, interviews and observations. Data results overwhelmingly showed positive gains in the participants, in comparison to the control group, with regard to high engagement and continuing motivation in STEAM. The implications of this study are that, through executing similar space education programs worldwide, students are more likely to continue on to STEAM fields in the future; a topic of high interest due to the increasing demand worldwide. This study is of value to educational and scientific communities because it contributes to a better understanding of ways in which to inspire, innovate and discover for the benefit of humankind.