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AD ASTRA ACADEMY: USING SPACE EXPLORATION TO PROMOTE STUDENT LEARNING AND MOTIVATION IN THE CITY OF GOD, RIO DE JANEIRO, BRAZIL

Abstract

Motivation is a primary determinant of a student's academic success, but in many under-resourced educational contexts around the world, opportunities to develop motivation are lacking. Space exploration provides compelling material to spark academic interest and sustain motivation. Over a period of four years, the Ad Astra Academy enacted a series of brief (1-2 week), interactive interventions for students in the City of God neighborhood of Rio de Janeiro, Brazil, targeting teenagers at risk of dropping out of school. The programs integrated classroom lectures, interactive exercises, full-day field trips outside the city, and immersive Capstone Projects involving the active NASA Mars Reconnaissance Orbiter (MRO) and Mars Science Laboratory (MSL) missions. Students made requests for high-resolution images of Mars and provided scientific justifications in live video calls to MRO and MSL scientists and engineers; based on these requests, four new observations were acquired by the MRO HiRISE instrument, which the students later analyzed. By bringing the excitement of space exploration to students in one of the most underserved regions of the world – and giving them an opportunity to contribute to active NASA missions – Ad Astra Academy programs are non-traditional and unique. Our team included an "international team" (consisting of American and Brazilian scientists and educators who work at U.S. institutions) in conjunction with a "local team" (consisting of Brazilian scientists and educators who work in Rio de Janeiro). The international team brought a breadth of planetary science expertise and direct connections to NASA missions, while the local team fostered effective communication and featured more relatable role models for the students. Individual testimonials from students and progression through academic milestones suggest that, for a subset of participants, the Ad Astra Academy programs were transformative events. To further the impact of the program, a subset of students were awarded paid internships in partnership with a local science museum. Analysis of pre- and post-tests showed that students expressed a markedly enhanced ability and desire to engage in scientific research following the programs. While longitudinal study and a more robust sample size are required to bolster conclusions about the efficacy of our approach, the initial results suggest that brief, impactful interventions can play a positive role in a student's educational trajectory through enhanced autonomy and self-efficacy.