

IAF SPACE EDUCATION AND OUTREACH SYMPOSIUM (E1)  
Lift Off: Primary and Secondary Education (1)

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STUDENT SKILLS IMPROVEMENT THROUGH SPACE EDUCATIONAL COMPETITIONS USING  
AN EDUCATIONAL EXPLORATORY ROVER

**Abstract**

ROSITA (Italian Space Rover - [www.roverspazialeitaliano.it](http://www.roverspazialeitaliano.it)) is an educational project focused on student competitions (11-18 y.o.) about planetary exploration using a low-cost self-built exploratory rover. It aims to measure the impact of the educational program in improving students' hard and soft skills. The project has been run for the last three years, involving a total of more than 100 schools, 100 teachers, and 600 students in Italy. The relevance of ROSITA as a Space educational initiative is based on the involvement of a wide range of students and teachers, hands-on and long-term formation on scientific and technical subjects, an indoor and easy to set-up environment to reproduce the challenges of rover exploratory missions and remote robot programming.

Students and teachers are involved in activities aiming at finding out the beauty of STEM disciplines, underlining their potential for future studies and careers, minimizing the gender gap, and gaining hard and soft skills. The educational methodology is based on cooperative learning inspired by the 4P model (Projects, Peer, Passion, Play): students form teams, build their own robot (or use a virtual environment), learn how to program it and attend competitions among teams.

In each team, students have to collaboratively adopt the best techniques to remotely program the rover to search for information (tagged rocks) in an unknown area, by looking only at the data coming from the robot's sensors (sparse images taken with a camera mounted on the robot). So, technology becomes itself a pedagogical environment.

The challenge for students is to assess the situation by looking just at a few camera snapshots (not a video stream) with delay, to write a correct program to send to the rover, to predict and correctly interpret

the information from the observations received at the end of each step. Different programming interfaces have been realized for different students ages and skills. Three geographically distributed competitions have been organised every year, scoring teams with the number of information collected within a time limit.

Questionnaires have been used to assess the project impact on students' perceptions, in terms of hard and soft skills owned and/or acquired. Results show that students acquire soft skills related to teamwork and more self-confidence about STEM careers.

We believe that the educational format experimented in the ROSITA project, which is fully open-hardware, open-software, open-courseware, can be extended to other communities (e.g., schools of other countries), as well as to other technological sectors.