

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

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MIT ZERO-G OUTREACH INITIATIVE: USING EXPERIMENT DESIGN AND VIRTUAL REALITY  
TO INSPIRE THE NEXT GENERATION OF SPACE SCIENTISTS AND ENGINEERS**Abstract**

MIT's Space Exploration Initiative offers a course on project development, prototyping, and deployment readiness for parabolic flights, culminating in a research flight with Zero-G. MIT's Resource Exploration and Science of our Cosmic Environment (RESOURCE) team participated in the fall 2021 course with a Zero-G flight in May of 2022 testing technology for a virtual reality platform for enabling science on Lunar rover exploration missions. In parallel with the scientific effort, the team developed the MIT Zero-G Outreach Initiative (0G-OI), an outreach program to engage with the Cambridge Public School's (CPS) grade 7 classes to teach them about research in microgravity, parabolic flight, and experiment design. The goal of the outreach program is to inspire the next generation of space scientists and engineers using virtual reality.

The CPS grade 7 curriculum covers 'Mysteries of the Universe' where students consider the role of gravity in the solar system. They also complete a unit on roller coasters in which they learn about key ideas of force, motion, and energy through the context of roller coasters. The 0G-OI Initiative ties these two units together through five videos covering: 1) an overview of the initiative, 2) the basics of parabolic flight and how we perceive gravity, 3) an overview of gravity and its function in the universe, 4) why and what we can study in microgravity and 5) how to design an experiment for microgravity. The students then design their own experiments for microgravity. These are down-selected to the top 5 experiments that are reviewed by a panel of astronauts to select one experiment to fly on the MIT chartered Zero-G parabolic flight. The flight and the experiment are filmed in VR video by the MIT RESOURCE team. Each participating school is provided with an Oculus Quest 2 VR headset and a flight day is held at each school where the students experience the Zero-G flight and see the results of their experiment in an immersive VR environment. Using this initial setup, the 0G-OI can be run annually in parallel with MIT's SEI parabolic flight course.

Some lessons learned included keeping the videos under 10 minutes, having astronauts select the winning experiment provided incentive and finally, using VR, as this technology is commonly associated

with gaming and entertainment. The 0G-OI aims to develop a lasting relationship with the CPSs and make the exciting experience of parabolic flight and space exploration an accessible experience.