



Student Spaceflight Experiment Program (<http://ssep.ncesse.org>)

A Program of the National Center for Earth and Space Science Education (<http://ncesse.org>),
and the Arthur C. Clarke Institute for Space Education (<http://clarkeinstitute.org>),

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Created to Address U.S. Strategic Need in Workforce Development for the 21st Century: high caliber STEM education program tuned to next generation national science education standards; designed as a pedagogical model for inspiring and engaging the next generation of American scientists and engineers; utilization of the International Space Station for STEM education; bold new commercial space venture

The Student Spaceflight Experiments Program (SSEP) was launched June 2010 by the National Center for Earth and Space Science Education (NCESSSE) in partnership with NanoRacks, LLC. It is a remarkable U.S. national Science, Technology, Engineering, and Mathematics (STEM) education initiative that gives typically 300+ students across a community the ability to design and propose real experiments to fly in low Earth orbit, first aboard the final flights of the Space Shuttle, and then on the International Space Station—America’s newest National Laboratory.

Each community participating in SSEP conducts a local **Flight Experiment Design Competition**, with their student teams vying to fly an experiment in low Earth orbit in a real research mini-laboratory

SSEP is the best real life application program that my students have ever experienced

- Alison Thammovongsa, 7th grade science teacher,
Peoria Unified School District

reserved ***just for their community***. Mirroring how professional research is done, student teams across the community submit formal research proposals, which go through a 2-step proposal review process to select the flight experiment for the community. The design competition – from program start, to experiment design, to submission of proposals by student teams – runs a minimum of 9 weeks. Students can design experiments in diverse fields, including: seed germination, crystal growth, physiology and life cycles of microorganisms (*e.g.* bacteria), food studies, and studies of micro-aquatic life. Content resources for teachers and students support foundational instruction on science in microgravity and experimental design. A suite of SSEP program elements – the **Community Program** – leverages the flight experiment design competition to engage the entire community, embracing a Learning Community Model for STEM education.

- True STEM Education Initiative: real experiment design across all science disciplines (physical, chemical, and biological); seamless fusion with technology, engineering, and mathematics; interdisciplinary with writing, oral communication, and art and design.
- Systemic Initiative: applicable across an entire school district, addressing state and local strategic needs in STEM education, next gen national science standards, and applicable across grades 5-16.

- Community Engagement Model for STEM Education: SSEP is designed to engage students across grades K-16, teachers, families, civic and business organizations, and research institutions.
- Track Record: 14 SSEP flight opportunities have been undertaken since program inception in June 2010 with **165 participating communities** in the U.S. (reflecting 40 States and the District of Columbia), Canada (4 Provinces), and Brazil.

Data available through the first 14 opportunities: **86,800 grade 5-16 students** were fully immersed in microgravity experiment design and proposal writing; and **18,759 flight experiment proposals** were received from student teams. To date, **206 experiments have flown** on the final two Space Shuttle flights and to ISS, and **34 more experiments** are slated to fly in Spring/Summer 2017 on SpaceX-15.

- Authentic Immersion in Scientific Research: SSEP precisely models the breadth and depth of real research by the professional community, including definition of a research program by a research team with PIs, Co-Is and Collaborators; writing proposals against a real proposal guideline with a formal evaluation rubric; a real 2-step proposal review process; formal NASA flight safety review for selected experiments; and an annual research conference at the Smithsonian National Air and Space Museum.

This might be the best experience I have ever had. The opportunity to work with others that enjoy science as much as I do was great. It opened my eyes to how the scientific method is used in real life. This has shown me that if you work as a team and bounce ideas off each other you can accomplish anything.

- Alex A., Grade 8, Mendenhall MS, Guilford County, Greensboro, NC

- Deep Investment in Partnership: over 920 Local Partners, including: school districts, private schools, 30 NASA Space Grant colleges and universities, businesses, foundations, private philanthropists, and local research institutions providing science advisors.
- High Profile National Partners: Smithsonian National Air and Space Museum, DreamUp, NanoRacks, Center for the Advancement of Science in Space (CASIS), Subaru of America, Inc, and Magellan Aerospace.
- High Profile Program: garnering very significant media coverage at local, regional, and national levels; transport to the International Space Station aboard next generation commercial carriers: SpaceX Dragon, from Kennedy Space Center, FL, and Orbital Sciences/ATK Cygnus, from the Mid-Atlantic Regional Spaceport, VA; student delegations at launches; experiments aboard U.S. National Laboratory on the International Space Station and overseen by an astronaut.
- Breaking New Ground in Commercial Space: SSEP is the first pre-college STEM education program that is both a U.S. national initiative and implemented as an on-orbit commercial space venture.
- Expansion internationally in 2012, with 10 communities that have participated to date in Canada (Manitoba, Ontario, Alberta, and British Columbia), and 1 in Brazil.

The Student Spaceflight Experiments Program is a program of the National Center for Earth and Space Science Education (NCESSSE) in the U.S. and the Arthur C. Clarke Institute for Space Education internationally. It is enabled through a strategic partnership with DreamUp PBC and NanoRacks LLC, which are working with NASA under a Space Act Agreement as part of the utilization of the International Space Station as a National Laboratory.