



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>),

Revised: January 28, 2020

Created to address U.S. Strategic Need in Workforce Development for the 21st Century: a high caliber STEM education program tuned to Next Generation Science 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; a bold new commercial space venture

The Student Spaceflight Experiments Program (SSEP) was launched in June 2010 by the National Center for Earth and Space Science Education (NCESSSE) in strategic partnership with NanoRacks, LLC. Designed as a model U.S. national Science, Technology, Engineering, and Mathematics (STEM) education initiative, the program gives students across a participating community the ability to design and propose real microgravity experiments to fly in low Earth orbit (experiments conducted in a “weightless” environment). SSEP was first carried out aboard the final two flights of the U.S. Space Shuttle Program in 2011 (STS-134 Endeavour, STS-135 Atlantis). In 2012 SSEP transitioned to operations on the International Space Station (ISS) – America’s newest National 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

- SSEP is suitable for students in pre-college grades 5-12, 2-year community colleges, and 4-year colleges and universities. For pre-college grades 5-12, each community typically engages 300+ students in microgravity experiment design and proposal writing. For an undergraduate community, it is expected that at least 30 students will be engaged.
- Each community participating in SSEP is provided a flight slot to fly one student team designed microgravity experiment to ISS where it is operated by the astronauts.
- Mirroring how professional research is done, each community conducts a **Flight Experiment Design Competition**, where student teams (typically 50-80 teams in a pre-college community) each submit a formal proposal for a microgravity experiment. All proposals go through a formal review 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 9 weeks.
- True STEM Education Initiative: real experiment design across all science disciplines (physical, chemical, and biological); seamless fusion with technology, engineering, and mathematics; required interdisciplinary skills: technical 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 Generation 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: 16 SSEP flight opportunities have been undertaken since program inception in June 2010 with **191 participating communities** in the U.S. (reflecting 42 States and the District of Columbia), Canada (5 Provinces), and Brazil.

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

Data available through the first 16 opportunities: **126,600 grade 5-16 students** were fully immersed in microgravity

experiment design and proposal writing; and **25,518 flight experiment proposals** were received from student teams. To date, **281 experiments have flown** on the final two Space Shuttle flights and to ISS, with **33** more flying in Summer 2020.

- 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.
- Deep Investment in Partnership: over 1,270 Local Partners, including: school districts, private schools, 34 NASA Space Grant lead colleges and universities, businesses, foundations, private philanthropists, and local research institutions providing science advisors.
- High Profile National Partners: Smithsonian National Air and Space Museum, NanoRacks, International Space Station U.S. National Laboratory, Subaru of America, Inc, and Magellan Aerospace.
- High Profile Program: garnering significant media coverage at local, regional, and national levels, over 1,200 articles to date; transport to the International Space Station aboard next generation commercial carriers: SpaceX Dragon, from Kennedy Space Center, FL, and Northrop Grumman Cygnus, from Mid-Atlantic Regional Spaceport, VA; student delegations at launches; experiments aboard U.S. National Lab 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 14 communities that have participated to date in Canada (in Manitoba, Ontario, Alberta, Nova Scotia, 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 (NCESSE) 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.